

Desiccated blood + + + + +



DESICCATED

BLOOD FOR RECTAL ALIMENTATION

AND

OTHER LITERATURE

ON THE

SUBJECT

OF

ALIMENTATION PER RECTUM

Copied from "The Medical Record," and from papers read before the New York Academy of Medicine, Therapeutical Society and Gynecological Society.



Presented to the Medical Profession by

PARKE, DAVIS & CO.,

MANUFACTURING CHEMISTS,

DETROIT, MICHIGAN.

Gelatine Suppository Capsules.

OLEIC ACID AND THE OLEATES OF THE ALKALOIDS.

Suggested by F. E. STEWART, PH.G., M.D., of New York,

FOR RECTAL MEDICATION.

For the introduction of remedies into the rectum, a vehicle of sufficient consistency to overcome the resistance of the sphincter muscle is necessary. This is obtained in the Suppository as ordered by the U. S. P., by the use of Butter of Cocoa.

OBJECTIONS.

1st. Suppositories, when sufficiently hard for successful insertion, frequently do not fuse at the temperature of the body, and are then useless.

2d. Suppositories melting at the temperature of the body, lose consistency in hot weather.

3d. Butter of Cocoa coats the bowel and greatly retards absorption, as proved by Ellerslie Wallace, M.D., Professor of Obstetrics at the Jefferson Medical College, Philadelphia.

4th. An expensive, tedious, and difficult process, requiring costly apparatus, time, and skill.

5th. Difficulty of retaining a homogeneous admixture of insoluble drug in liquid fat during the operation of pouring into molds.

6th. Danger from unequally divided medicinal portion on that account.

7th. Suppositories are disagreeable to patients.

TO OVERCOME.

A Rectal Capsule is a vehicle always possessing consistency, is unaffected by heat, and is easily dissolved by the warm secretion of the rectum. Its advantages are:

1st. Consistency for insertion. 2d. Simplicity. 3d. Accuracy—no danger from unequal division of medicinal portion. 4th. Cleanliness. 5th. Fats are dispensed with; also expensive manipulation. 6th. The contents of the capsules are preserved in an air-tight chamber.

OLEIC ACID.

When it is necessary to use a drug locally irritating for rectal medication, Oleic Acid presents an admirable diffusive agent, being perfectly bland and distinguished from its power of permeating the tissues. See article by John F. Marshall, F.R.S., *London Lancet*, May 25th, 1872.

OLEATES OF THE ALKALOIDS.

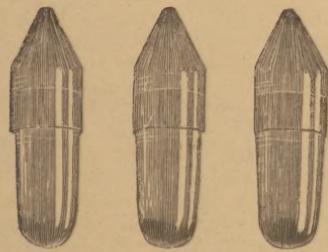
The oleates of the alkaloids are liquid salts. "The salts of Morphia, Atropia, and Strychnia, in solution, are absorbed as quickly, and the last named more quickly by the rectum than by the stomach."—*Barthelow's Materia Medica and Therapeutics*, page 9, ed. 1878.

PROPERTIES OF THE RECTAL CAPSULE.

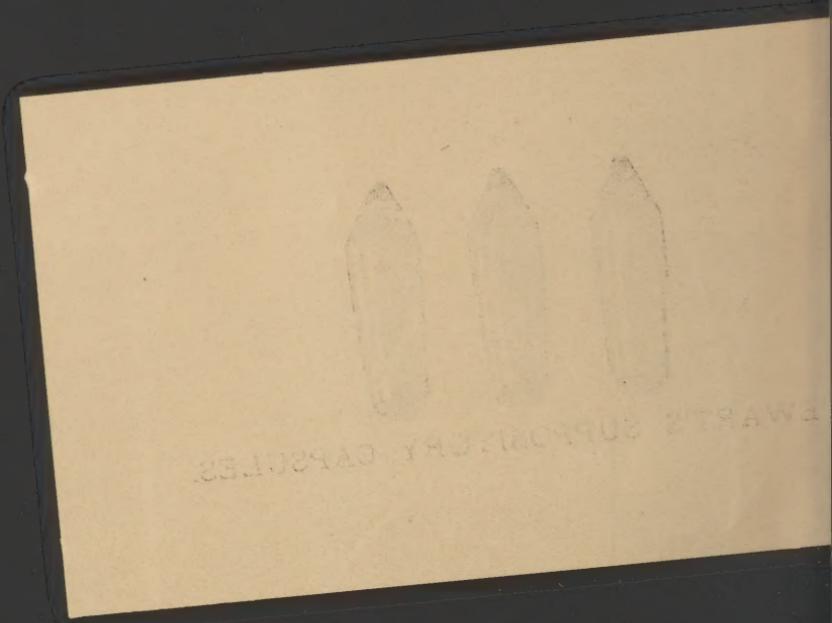
"In relation to other properties of the rectal capsules, they are quickly soluble in water at 90° F. In water at 60° they swell up, become opalescent, very soft, and dissolve after long immersion. Filled with cold water and placed on a plate, they lose consistency in about eight minutes, so that very moderate pressure robs them of their contents. On the tongue they dissolve and disappear altogether in about three minutes, usually less, depending on slight variation of thickness in their walls. In the rectum they melt in about four minutes; but if removed in three minutes, one side will usually be found dissolved, thus liberating their contents. If filled with any ingredient melting at the temperature of the body, the rectal capsule will not delay its fusibility, and such article, inserted by means of the rectal capsule, will surely produce its effect almost as quickly as without it. Finally, these facts have been substantiated by thorough tests in numerous cases in both New York and Philadelphia, in private and hospital practice."—F. E. STEWART, PH.G., M.D., in *New Remedies*, for December, 1879.

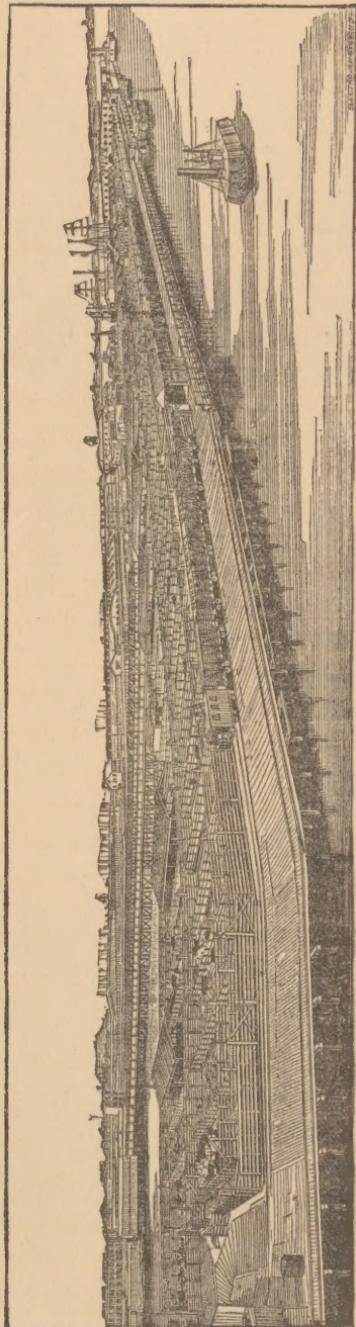
We are prepared to furnish Rectal Capsules empty, or with the Oleates of Alkaloids.

PARKE, DAVIS & CO., Detroit, Mich.



STEWART'S SUPPOSITORY CAPSULES.





CENTRAL STOCK-YARDS AND TRANSIT COMPANY,

JERSEY CITY, N. J.

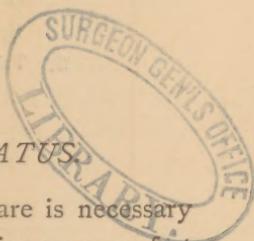
These Yards have a daily capacity for 8,000 cattle and 20,000 sheep, with ample facilities for watering and feeding. The Abattoir has a capacity for slaughtering 2,000 cattle and 10,000 sheep daily. All cattle and sheep not slaughtered on the premises are delivered by large steam cattle-boats, owned by the Company, direct to the slaughtering-pens of the butchers in New York City, Brooklyn, and other places.

TO THE MEDICAL PROFESSION.

The worth of Defibrinated Blood for Rectal Alimentation has been thoroughly demonstrated by Dr. A. H. Smith, at St. Luke's Hospital, and its use formally recognized by the New York Therapeutical Society. This, and the additional testimony of Prof. Flint, in his paper read before the New York Academy of Medicine, and of Dr. Henry F. Campbell, of Augusta, Georgia, reported to the Gynecological Society, with regard to the value of alimentation per rectum, would seem to fully justify our introduction of this new remedy to the general notice of the profession. We have therefore taken advantage of the recent utilization of defibrinated blood by the process recommended by F. E. Stewart, Ph.G., M.D., of New York, published in the Medical Record, January 3, 1880, to supply the profession with DESICCATED BLOOD FOR RECTAL ALIMENTATION.

SANGUIS BOVINUS EXSICCATUS

In the preparation of this article, great care is necessary both in selecting and killing the animals, to insure a perfect product. The process of drying, also, is one of extreme delicacy, requiring costly apparatus and the attention of a skilled chemist. We have, therefore, been fortunate in securing the unlimited facilities of the Central Stock-Yards and Transit Com-



pany, of Jersey City, and the improvisory care of the well-known expert of the company, Dr. J. J. Craven, inventor of the great ship-refrigerators for preserving meat during ocean voyages. At these stock-yards is concentrated the immense live-stock traffic of the Erie and Pennsylvania Railroads, bringing cattle from all parts of the United States, and from this great variety of stock is selected the finest of the choice Colorado steers picked for European exportation, and killed for this purpose. The selection, killing, and preparation of the blood are conducted under the direct supervision of Dr. Craven ; the desiccation is performed with the greatest care in the most approved apparatus of his construction, and special attention is paid in all details to chemical and vital phenomena. We can, therefore, guarantee this article in every respect.

NOTE.

Desiccated Blood PER OREM, as a substitute for the various so-called extracts of beef, is now under trial at several of the New York Hospitals. The results of the experiments will be made public. The following formula is recommended :

B.	Sang. Bov. Exs'ct.,	.	.	.	.	.	3 vi.
	Aqua,	.	.	.	.	.	3 iv.
M.	Ft. sol. et ad,						
	Glycerine,						
	Spts. Vin. Gal., ॥,	.	.	.	.	.	3 i.
S.	Tablespoonful every three hours.						

PARKE, DAVIS & CO.,
Manufacturing Chemists, Detroit, Mich.

A NEW METHOD OF RECTAL ALIMENTATION.

By F. E. STEWART, PH.G., M.D.,
NEW YORK.

IN my article published in *New Remedies*, Vol. VIII., No. 12, entitled, "A New Method of Rectal Medication," calling attention to rectal (gelatin) capsules and the oleates of the alkaloids per rectum, the absorbent power of the intestinal mucous membrane was quite fully discussed. Advantage has long been taken of this power for the purpose of alimentation as well as medication; and although the rectum, as an absorbing surface, is inferior to the stomach, and, for obvious reasons, not fitted to take its place as the organ of digestion, still this power of taking up food is of great importance when for any cause the stomach is incapable of performing its function.

For alimentation, the rectum can be resorted to as an auxiliary organ to the stomach, or it can be used for a time as a substitute for it, in supplying the system with food. It is to the former we wish to call attention, and to desiccated defibrinated blood as an agent especially adapted for rectal alimentation.

But, before proceeding, an explanation is necessary. For more than a year past the writer has been experimenting with defibrinated blood as an aliment in disease. The subject was suggested by the popular idea that warm, fresh, defibrinated blood, quaffed at the butcher's shambles, is remedial in consumption and other wasting diseases. Investigation of this singular practice certainly does show that many cases are remarkably benefited by it. This, of course, can be accounted for in many ways without referring it to the blood—the healthy outdoor exercise of a walk, or ride, to the abattoir, or diversion of the mind by so novel a rem-

edy; but it cannot be denied that defibrinated blood is rich in the elements of nutrition, and the resulting benefit of its use is out of proportion to the novelty of the medicine or healthy exercise in obtaining it.

To utilize, therefore, what appeared to be a valuable product, a process was devised for drying it quickly, to prevent decomposition, and at a low heat. After shipping a large invoice of this desiccated blood to Detroit, to be used as an aliment, I discovered that Dr. A. H. Smith, physician to St. Luke's Hospital, New York City, was also at work with defibrinated blood, and had proved its therapeutic worth in more than sixty cases. At my request, Dr. Smith substituted the dried article at St. Luke's, where it is now on trial, and appears to be of equal worth to the blood before preparation.

This, then, will explain the reason why desiccated blood is brought to the notice of the profession as a new article for rectal alimentation.

There are three ways by which blood can be introduced into the system—per orem, by transfusion, and per rectum. The last-named seems, for many reasons, the least objectionable. Naturally enough, drinking blood is disgusting to patients. Transfusion, even in the most careful hands, is not devoid of danger. But injection per rectum is an easy and safe operation, which can be frequently repeated without risk of injury.

Blood per rectum has also the advantage possessed by transfusion, of not being subject to the changes incident to the process of digestion.

Various articles are used for rectal alimentation—milk, albumen, and lately albuminose has been recommended. To be of any use to the system, they must be taken into the circulation, converted into blood, or else substituted for it. Blood is the product of digestion, and it is supposed that before food can be converted into blood, the saliva, gastric, pancreatic, and intestinal juices and bile must perform their action, absorption must take place, and finally, that wonderful, vital constructive process by which the corpuscles are made, and the blood is fitted to perform its part in nutrition.

If this be all true, blood cannot be manufactured from these articles when injected into the rectum, and their beneficial effect must be accounted for in some other way. It would seem, therefore, that blood itself, for rectal alimentation, if absorbed, would be more suitable to meet the wants of the system.

Blood is the food and air of the tissues. As it is the province of the vegetable world to convert the elements of surrounding nature into organic forms fitted for food, so it is the province of digestion to convert food into blood to feed the vital organs. Blood is therefore called the *vital fluid or the life*, and its presence in the vital organs is indispensable to their function. Only a momentary arrest from the brain results in syncope or fainting away, and any organ deprived of it soon loses functional activity. Supplies for the growth and repair of the whole body are in the blood. Blood is but the body in a liquid state. Being, therefore, perfectly adapted to build and construct tissues, and indispensable to life, its administration would seem to be indicated when tissues are wasted and life is threatened by disease.

Like other vital organs, the nerves depend directly on the blood for their functional activity, and deprivation results in morbid phenomena. Close physiological relations exist between the red globules of the blood and the healthy life of the nerves. This relation is probably between the haemoglobin—the red coloring matter of the blood, which forms the principal substance of which the red globules are composed (about 25 to 30 per cent. of their weight, or 86 per cent. of their solid ingredients)—and the nerves. A morbid diminution of the red globules is designated anæmia. As the action of every organ in the body depends upon the nerves, it naturally follows that, if they be impaired, there is a general deficiency of functional energy. All the vital functions are languidly performed. The action of the heart is feeble and easily disturbed. Mental energy, strength of will and purpose, are diminished. Neither can the action of impaired nerves on the secretory organs manufacture healthy digestive fluids for the preparation of food to be converted into

healthy blood, so necessary for nerve-supply. Then, too, the brain sympathizes in this condition, and the mind, becoming affected, in turn reacts on the nerves to increase the disorder.

Nutrition is directly under nerve control. Every secreting cell, every absorbing villi, the inherent power of each tissue to select from the blood appropriate matter for its repair, even the muscles for respiration, are supplied by artery and vein with nerves to guide their action, for the purpose of furnishing them with blood to be used for building new tissue, and to impart nerve-force to repair that lost in the exercise of their functions.

Desiccated blood is therefore suggested for rectal alimentation, when the life-powers are threatened by asthenia due either to loss of blood, loss of nerve-power, or to both. It is indicated in all cases where, for any reason, digestion is impaired, in cachectic states from special constitutional poisons, and in all cases when impaired blood, nerves, or digestion give rise to the anæmic condition, with its resulting general debility, hypochondriasis, or other functional disorder.

It is hardly reasonable to infer, and clinical experience does not justify us in believing, that blood is absorbed from the rectum without a breaking down of the corpuscles; but there are good reasons to suppose that it enters the system without marked chemical change, and it has been satisfactorily proved, by Dr. Smith and other scientific physicians, that its use is remarkably beneficial to patients. How much this is due to the haemoglobin and its action on the nerves, remains an interesting matter to determine.

Blood for rectal alimentation must be from healthy animals. Inflammatory blood from diseased cattle will not do, or blood from animals fatigued by long journeys. None but powerful, vigorous bullocks, fed and rested until the heart's action regains its accustomed tone, should be selected for this purpose.

Killing must be done in a manner to secure healthy blood. This can be accomplished only by bleeding to death. Striking on the head, or in any other way causing death from

apnœa, prevents a proper arterialization of the blood. Blood from animals killed in this manner, or the inflammatory blood from diseased cattle, is unfit for use in the arts, and therefore must be too imperfect for employment in therapeutics.

Great care also must be taken in the preparation, due attention being paid to all chemical and vital phenomena. Long exposure to the air in a fluid condition, or too high heat, not only decomposes, but devitalizes it, and, if the heat be raised to 160° F., coagulates the albumen. No heat above 110° F. should be used in drying the blood, and the process should be as instantaneous as possible, and without agitation.

Desiccated blood, as thus prepared, is completely and readily soluble in water at all temperatures below 160° F., and contains all the elements of blood, except water and fibrin. The loss of the latter does not seem to impair its nutritive value, being but a very small proportion of the nitrogenous constituents of the blood.

A little more than a drachm of the dried article is necessary to represent a fluid ounce of blood of ordinary specific gravity; but it is sufficient to remember, in using, to employ a drachm to the ounce of water. To dissolve, it should be thrown into water, and allowed to stand until the albumen becomes perfectly soft, to prevent sticking to stirring-rod or dish. Gentle agitation will then convert it into a perfectly homogeneous fluid, closely resembling fresh blood. It is a very difficult matter to dissolve dried blood by pouring water upon it, for it immediately adheres together in lumps, and sticks to everything brought into contact with it.

From four to six drachms of the powder daily, or more, is the dose, which may be given at once, at bedtime, or in divided portions during the day, as circumstances seem to require.

If a greater amount than can be absorbed be injected at once, and decomposition result therefrom, it is advised to wash out the rectum with tepid water before continuing the medication.

For further information on this subject, the reader is re-

ferred to Dr. Smith's paper, read before the New York Academy of Medicine, to his paper before the Therapeutical Society, and to the minutes of these respective societies for their action in the matter.

The Medical Record and *New York Medical Journal* have reported on these papers, and are also referred to as containing very nearly as full information.

SUPPLEMENTARY RECTAL ALIMENTATION, AND
ESPECIALLY BY DEFIBRINATED BLOOD, AS
APPLICABLE TO A LARGE RANGE OF CASES
IN WHICH NUTRITIVE ENEMATA HAVE NOT
HERETOFORE BEEN EMPLOYED.¹

By ANDREW H. SMITH, M.D.,
PHYSICIAN TO ST. LUKE'S HOSPITAL.

IN contrasting the practice of medicine of to-day with that which prevailed fifty, forty, or even thirty years ago, the salient difference which is at once apparent is in the prominence which is now given to the "supporting" instead of the former reducing treatment. Indeed, the period I have named has witnessed a complete revolution in the opinions and practice of the profession on this point. Forty years ago, inflammatory and febrile affections were very generally supposed to require antiphlogistic treatment—the lancet, calomel, and antimony—and to these were added the lowering effect of the antiphlogistic regimen, of which water-gruel formed a prominent factor. At the present time, the term antiphlogistic treatment is obsolete, and with it the antiphlogistic regimen has become a thing of the past.

This is the result of a conviction, which, after the lapse of centuries of observation and study, has somewhat suddenly dawned upon the profession: that disease is a burden imposed upon the economy, which can be sustained and ultimately thrown off only by an expenditure of vital energy; and that in increasing, and not in diminishing vital force, are we furthering the reparative processes of nature.

At the present day, with the exception of diseases located in the digestive organs themselves, and which require rest of

¹ Read before the N. Y. Academy of Medicine, February 20, 1879.

these organs from functional activity, there is scarcely any affection in which it is considered necessary to withhold the amount of nourishment which the stomach craves, while in very many cases benefit is thought to follow the administration of a much larger quantity than the patient desires. Even in surgical cases occurring suddenly in persons previously in perfect health, the value of generous alimentation is recognized, and was ably advocated by Prof. H. Hamilton in a paper read before this body two years ago.

If, then, we considered the principle established, that the chances for recovery in the vast majority of cases are promoted by keeping the nutrition as nearly as possible up to the normal standard, the question arises: How can this object best be obtained? There can be no hesitation in saying that the most natural means are the best, so long as they are adequate. If the stomach will take and digest sufficient food, and if the absorption and assimilation go on regularly and properly, there is no need for anything more, and there can be nothing better.

But there may be an obstacle to the introduction of food into the stomach, or to its passage beyond the pylorus; or there may be inflammation or ulceration of the stomach, causing ejection of the food; or, from some reflex irritation, vomiting without actual gastric disease, may occur to an extent to imperil life. For this class of cases, in which the function of the stomach is practically suspended, rectal alimentation is clearly indicated. I need only refer you to the able and exhaustive paper read by Prof. Flint before the Academy in December, 1877, for a complete discussion of this most interesting topic, as limited to this class of cases.

But it is the object of this paper to inquire whether nutritive enemata may not be useful in a great many other conditions—not as a substitute for, but as an aid to, stomach alimentation; and to answer this question as well as I can, by laying before you the experience acquired in about eighty cases treated in this way by myself and some of my friends, during the past year.

There are a variety of conditions of the system that have this in common, that the stomach, though not the seat of

structural change, is what is termed in popular language, *weak*. There is little desire for food, and the food that is acceptable is not of a nourishing character. If a larger amount of food is forced down, or if something more solid is taken, the result is either vomiting, or the flatulence, or diarrhoea, which depend upon the passage of undigested food into the intestinal canal. But often these effects are not observed, for the want of appetite removes from the patient all temptation to go beyond his digestive power, and he is satisfied to abstain from the food for which he has so little relish. Thus he lives in a state of semi-starvation, and the ill-nourished tissues, from lack of vitality, too often fall a prey to structural degeneration.

This condition, when standing by itself, is recognized as atonic dyspepsia; but it is the accompaniment or result of a wide range of affections by which it is overshadowed, and which sometimes cause its importance to be overlooked.

Now, if poverty of blood is not the original occasion of the weak stomach, it very speedily becomes its result. Indeed, these two conditions necessarily act reciprocally as cause and effect. And the reason of this is plain. Weakness of the stomach—and by the word stomach in this connection I mean the whole alimentary apparatus), depriving the system of a portion of its necessary supply of nutritive material, must result in impoverishment of the blood; while a stomach whose nerves, muscular fibres and glands, are supplied with thin and watery blood must be irritable, must perform its muscular movements languidly, and must afford a weak and inefficient secretion for the solution of food—in other words, must become weak. Thus we have a circle established, atonic dyspepsia producing poverty of the blood, poverty of the blood producing atonic dyspepsia.

I have lately read in one of our journals of a case in which, without any obvious cause, the heart's action was found to be growing weak. From hour to hour the pulse became feebler, and the ear applied to the chest heard the heart-beats fainter and fainter. There was no evidence of any internal hemorrhage; there was no brain-lesion to paralyze the heart, no cardiac poison had been taken. The

entire symptomatology was summed up in the one expression —failure of the heart. All the stimulants given produced no effect, and the doctors could only stand by with finger on the pulse and note that life was fast going out. Why, they could not tell. The autopsy solved the riddle. In one of the coronary arteries was lodged an embolus, and the heart, upon which the whole frame depended for blood, was itself left bloodless.

How often is the stomach in like case? The whole system looks to it for nourishment; yet it is itself often nourished with such a beggarly quality of blood that, like the heart in the case I have cited, it has no longer strength to carry on its work.

This condition may, as I have remarked, stand by itself; but it is much more frequently the result of some other disorder, past or present. In these cases the blood may first be affected, and through it the stomach; or the stomach may suffer first, and through it the blood.

The blood is first affected in hemorrhages, protracted suppuration, in scrofula, phthisis, renal disease, etc., while the first attack is upon the stomach in diseases which are located in the organ itself, or which affect the nerves supplying it, or cause irritation in other organs which stand in intimate reflex relations to it, such as the uterus, the liver, and the brain.

The treatment of this condition as a complication is, of course, involved in that of the disease with which it is associated. But inasmuch as these diseases, when not actually incurable, are much more manageable if the nutrition can be maintained, it often becomes necessary to regard the defective action of the stomach as the principal feature in the case. In these cases, as well as when the condition is primary, the treatment has heretofore been narrowed down to three lines of procedure. We have endeavored to furnish to the debilitated stomach an aliment which would require the least possible digestion; or we have attempted to supply artificially the necessary digestive fluids; or we have tried, by means of tonics, stimulants, haematics, etc., so to work upon the nervous and vascular supply of the stomach

as to force a more vigorous action. The first of these attempts has resulted in the multitude of patent foods with which the market is flooded, in the use of cod-liver oil, in the consumption of alcohol as a food, and last, but not least, in that most pitiful of all delusions, beef-extract.

To the second we owe pepsin in its myriad forms, pancreatin, and lastly in gluvin, prepared from the gizzard of the domestic fowl, and five times as strong as pepsin; and we may prophesy with confidence that ere long we shall find upon our tables illuminated circulars, in the highest style of decorative art, announcing a new preparation fifty times as strong as in gluvin, made from the gizzard of the ostrich. In the third, we employ, in short, the whole *materia medica*. And there can be no doubt that by a judicious use of these agencies, together with suitable hygienic measures, a vast amount of good can be, and is, accomplished. Still we must all confess that there is yet much to be desired, and that any plan which promises to help us out of even a part of the difficulties which we meet in treating these constantly recurring cases will be a welcome addition to our resources. For the condition of insufficient nutrition forms an important factor in almost all chronic diseases, and in many that are acute. Nay, it is the broad avenue by which death enters in those cases which terminate by exhaustion, and it aids also indirectly in the other modes of dissolution.

Such an addition to our resources as I have referred to is afforded, as I believe, by what I propose to call Supplementary Rectal Alimentation, that is to say, the use of rectal injections to supplement alimentation by the stomach.

The power of the rectum to absorb aliment has been so often demonstrated, and the demonstration has been so fully set forth before this body in the paper to which I have already referred, that time would be wasted in further argument to prove it. It remains only to consider whether the fact of such absorption can be turned to account in the class of cases now under discussion.

But here we are met at once by the question: If the stomach is in a great degree incapacitated for absorbing by the influence of some general condition of the system, will

not that incapacity necessarily extend to the rectum also? To this I answer, without hesitation, No. The fallacy that lies in this question is in assuming that the conditions for simple absorption in the stomach and in the rectum are alike, while, in fact, they are as different as possible. The stomach is an exceedingly complex organ, not designed merely to afford a surface for absorption, nor yet simply to reduce solid aliment to a fluid form, but which has for a part of its function to create, in many cases, new substances from the food presented to it. Thus, for example, albuminose is not a mere solution of the several nitrogenous principles of the food by the gastric juice, but a distinct principle in itself, the result of a recombination of elements. It is only after the reactions have taken place, of which the above is an example, that stomach absorption begins, and if digestion in this sense is interrupted, absorption is also suspended. Moreover, the stomach is the centre to which reflex influences tend from many other organs and parts of the body, and as such is liable to derangement in sympathy with them. But with the rectum all this is different. It is scarcely more than a passive pouch, whose mucous surface absorbs fluids much as the serous surface and the subcutaneous connective tissues do. It suffers but little reflex disturbance from excitement elsewhere, and is comparatively insensitive to irritation within itself.

Theoretically, then, we might anticipate what has been practically demonstrated—that the rectum will continue to absorb aliment long after the stomach has refused to perform its office.

But then another question arises: Does the absorption of a certain amount of aliment by the rectum do anything more than to add so much nutritive material to the blood? Does it help at all toward restoring a natural condition of nutrition, and shall we not, in any given case of a chronic character, stand just as much in need of such aid next week or next year as we do to-day? The answer is: In some cases, yes; in many cases, no. If the innutrition depends upon a cause which cannot be removed, a cause which might exist in a well-nourished body, doubtless the need for aid to the

stomach will continue. But if the condition be one simply of weak stomach, and the stomach is weak only because its muscle and glands and nerves are supplied with an impoverished blood, then every particle of aliment taken up from the rectum is absolutely curative. It helps to improve the condition of the blood, and its influence will be felt sooner in the stomach than anywhere else. The result will be improved appetite and better digestion, and the stomach will be brought nearer to the condition in which it can provide for its own necessities and for those of the system at large.

The result of a considerable number of cases in which transfusion of blood has been resorted to, to correct a condition of extreme innutrition, shows that a little extraneous aid is often all that is required to reverse the tendency of the system, and to give it an upward instead of a downward direction. How little is the strength of the engineer compared to the power of the mighty engine under his charge; yet that little strength exerted to carry the balance-wheel beyond the "centre" may prevent a stoppage of the whole machinery.

At the same time, the direct support to the system to be attained through nutritive enemata, independently of any improvement of stomach digestion, is not to be despised as a temporary resource in acute cases. There are many times when the stomach suddenly gives out, or when its fullest powers are not equal to the unusual demand upon them, and in such cases nourishing injections may render invaluable aid.

If, then, the value of this method of alimentation be conceded, the question arises: What is the best material to be employed? Milk, raw eggs, animal broths, etc., are usually employed. Since the publication of Prof. Leube's paper on rectal alimentation in 1872, the preparation which he recommended has come largely into use, and to this Dr. Flint gives the preference. It consists of the muscle of beef, partly digested by an artificial process, and brought to a sufficiently fluid condition to be administered by means of a syringe. Life has been sustained for periods of two or three weeks or longer with this preparation alone, and there can be no doubt

that a considerable proportion of it is absorbed. Yet it is only imperfectly dissolved and semi-liquid flesh, containing a great deal of innutritious fibre, and, as such, appears to me to be greatly inferior to the perfectly fluid and wholly absorbable flesh which nature has prepared in the form of blood. It was while listening to Dr. Flint's paper that it occurred to me that in no other substance could we be so certain of finding all the elements of blood as in blood itself, and that it would be better to make use of it before it had become solidified into the form of flesh than to take the flesh and try to reduce it again to a liquid state. A few experiments convinced me that the blood was very readily absorbed by the rectum, the corpuscles being taken up as well as the serum. In experiments of this kind, blood presents the advantage of distinguishing itself by its color from the faecal matters in the dejections, and it is thus easy to form an idea of the amount voided. I soon found that in many persons an enema of 90 to 120 grams (3-4 ounces) of blood administered at night would be so completely absorbed in the course of eight or ten hours that no trace of it could be found in the morning evacuation; while larger quantities, such as 180, 240, or even, in a few cases, 300 grams, were retained, and the evacuation showed simply a small quantity of a dark red material of a tarry consistence mingled with the faeces.

In order to retain blood in a fluid state, it is necessary to have it defibrinated at the moment it is drawn. The proportion of solid matter lost in this way is not great, and if, as Virchow asserts, the fibrin of the blood is an excrementitious product, only waiting to be removed, the loss is in reality a gain.

The process of defibrinating is understood at all the slaughter-houses, where the blood so prepared is known as "stirred blood."

Seeing how readily the corpuscles as well as the serous elements of blood are taken up from the rectum, it appears to me self-evident that the material thus added to the circulation, either directly by capillary absorption, or indirectly by way of the lacteals, the receptaculum chyli and the thoracic duct must be more nearly homologous with the blood

than would be the case if any other alimentary substance were employed. Nay, we may go farther, and state that it is more nearly homologous than some of the products of stomach digestion. Chyle, for example, as we all know, is a white, milky fluid, widely different in its sensible qualities from blood, and very different in its chemical constitution. To convert it into living, active blood, requires a process of elaboration, the steps of which have never been traced. How or where the transformation takes place we do not know. But it requires no argument to prove that a slight change must be more readily effected than a greater one, and that blood which has merely had its corpuscles dissolved presents the elements for the formation of living blood in a more readily available shape than a fluid so dissimilar as chyle, and *a fortiori*, as milk, eggs, or a solution of meat.

And here we are brought to the border of an unknown, unexplored territory. Libraries have been written on imperfect solution and absorption of nutritive material, but what do we know about imperfect conversion of what is absorbed into blood? Under what conditions may it arise, what relation may it have with fever, and to what extent may it not complicate the diseases which we are called upon every day to treat? As yet we can only conjecture, but into the void which exists in our knowledge, we may at least project this thought: that the nearer the substances absorbed approach to the character of blood, the less chance there will be of imperfect conversion into the blood. And I fully believe that blood absorbed from the rectum nourishes the system more directly and more efficiently than if the same blood were swallowed and digested in the stomach; for, in the first case, it enters the circulation but little different from the blood with which it mingles, while in the second case it becomes chyme—the same as any other chyme, and subject to the same conditions of absorption.

In urgent cases, and especially when the stomach cannot be called upon to perform its office, defibrinated blood may be injected into the rectum in quantities of from 30 to 90 grams every two or three hours. For chronic cases, in which it is designed merely to aid stomach nutrition, from 90 to

180 grams may be given once or twice a day. Given at bedtime it usually causes no discomfort during the night, and there is only the customary evacuation after breakfast the next morning. If thought desirable, another injection may then be given, the recumbent position being maintained for a few minutes, after which, as a rule, there is no consciousness of anything unusual in the bowel, and the patient may go about his daily occupation. Any ordinary syringe may be employed, care being taken to cleanse it thoroughly each time without delay, lest the valves become adherent and fail to act. It is not necessary that the blood should be warmed in all cases. Many patients can bear it perfectly well without. But if the rectum is at all irritable, it is best to put the quantity of blood required into a small tin vessel, and set it into warm water until it has acquired about the temperature of the body. Warming the injection also promotes rapidity of absorption, and is therefore important when the supporting effect is required with as little delay as possible. As bearing upon this point, the following experiments made last summer are of interest. I found that 8 grams of fl. ext. of rhubarb, in 20 grams of water at a temperature of 22.8° C. (73° F.), gave, in sixteen minutes after being taken into the stomach, the characteristic red color to the urine on the addition of caustic potash. Two trials of the same quantity at the same temperature, injected into the rectum, gave sixty-five and seventy minutes respectively, as the time required to produce the same effect. When the temperature of the injection was raised to 42.2° C. (108° F.), the red color was obtained in forty minutes, while at a temperature of 36.6° C. (98° F.), forty-two minutes were required.

An important observation bearing upon the absorption of enemata was made recently in my service at St. Luke's Hospital. A man with phthisis in the last stage, who was receiving every evening an injection of 120 grams of blood, died suddenly at 5 A.M., eight or nine hours after the last enema had been given. The amount of the injection was not sufficient to half fill the rectum, yet at the autopsy Dr. Satterthwaite found that the large intestine was very evenly lined with a coating of thickened blood, for a distance of

nearly three feet. Since then a case has come under my observation in which there is always a gurgling in the descending colon within a few minutes after the injection is received, indicating that the fluid is working its way upward. This is important as showing that even a small bulk of fluid thrown into the rectum spreads itself over a considerable absorbing surface. I am not aware that any other post-mortem observation of the character above mentioned has been made; indeed, with the substances usually employed for injections, it would be difficult to tell how far up they extended, since they could not be readily distinguished by their appearance from faecal matter.

The observation, perhaps, explains a fact mentioned by the late Dr. Peaslee, in the discussion upon Dr. Flint's paper, that he had often used the long tube in giving nutritive enemata, but never found that any advantage resulted from carrying the injection into the colon. Of course, it would be superfluous to do so if the fluid finds its way there of itself within a short time after it is thrown into the rectum.

As might be expected, there are occasionally inconveniences attending this treatment, and which may be so serious as to compel its abandonment. In the first place, the rectum may be so irritable that the injections will be immediately returned. This has happened only two or three times out of eighty cases, of which I have notes. Again, the injections may be retained for a while, but may produce severe colicky pains. Both these difficulties may sometimes be met successfully by giving the blood at first in very small quantities, warmed, and with the addition of a little tincture of opium. The bowel usually becomes more tolerant by habit.

More or less constipation occurs in perhaps one-third of the cases. In a case related to me by Dr. Seguin, he was obliged to give up the treatment on account of a very fetid odor emanating from the person. This was also noticed in one of my cases, but it continued only a few hours.

In another case, in the practice of Dr. A. E. M. Purdy, the patient refused to go on with the treatment because, as she averred, she tasted the blood.

In two cases the discharges were so very offensive as to

cause serious annoyance in the house. One of the patients was taking, on his own responsibility, 270 grams (9 ozs.) of blood every night. When the quantity was divided and half of it given in the morning, the difficulty nearly ceased.

In one case of ovarian neuralgia, not attended by anaemia, nervous irritability and insomnia were produced.

With these exceptions no cases have come to my knowledge in which the use of the blood has been attended by any ill effects.

The cases which I have treated, or of which I have notes furnished by my friends, cover a pretty wide range of afflictions, in all of which asthenia was a prominent condition, and presented the leading indication for treatment.

Naturally a considerable number of cases (about forty) were of pulmonary phthisis. This disease, perhaps more than any other, illustrates the reciprocal influence of an enfeebled stomach and impoverished blood. Whichever of these we regard as the cause, entails the other as its simultaneous effect. The tendency, therefore, must inevitably be from bad to worse, unless in some way the stomach can be strengthened so that it may afford an increased amount of pabulum to the blood, or the blood be enriched so that it may impart greater vigor to the stomach. The latter, we may hope to do in some measure by calling in the aid of the rectum, by which we may effect daily, or more frequently, a modified transfusion of rich blood into the circulation.

But there is also, perhaps, no other disease in which it is so difficult to determine the effect of treatment. Under any plan the condition of the patient is liable to sudden changes. The occurrence of even a moderate haemorrhage will cause a considerable loss of weight, which may be speedily regained under favorable conditions afterward. The same is true of intercurrent attacks of bronchitis, or of circumscribed pneumonia or pleurisy. An unfavorable change in the weather will aggravate the cough and wear down the strength and flesh, while an interval of warm, dry weather will cause a general feeling of improvement and encouragement, and tip the scale again the other way.

Besides, nearly all hospital patients with phthisis improve

during the first few weeks after admission, owing to the better hygienic and dietetic conditions by which they are surrounded. From all these considerations it is extremely unsafe to ascribe to a change of treatment either the falling off or the improvement which may follow, unless the relation of cause and effect is evident. Still, if the inauguration of a new treatment is seen to be promptly followed in some by a diminution of night-sweats, in others by an improved appetite and a gain in weight, in others by lessened cough and refreshing sleep, and in others still by a better color and reviving strength, we cannot resist the inference that the treatment is upon the whole beneficial, although in some other cases it appeared to be without result.

Excluding as carefully as possible the effect of other favorable influences, it seems to me that the use of defibrinated blood has resulted in marked benefit in about one-half of the cases of phthisis in which it has been tried, while in the remainder there has either been no improvement whatever, or none that could be confidently ascribed to the enemata. The test has been a severe one, inasmuch as in nearly every case the patient was already upon careful treatment with cod-liver oil, stimulants, tonics, quinine, etc., and the use of the blood was simply added to these. If, under these conditions, a prompt improvement has followed in a considerable number of cases, it would seem that a positive step in advance has been secured. I should hesitate, perhaps, to claim such results on my own unsupported testimony. But they have been observed in the practice of others as well as myself, and even my cases were for the most part under the observation of the House Staff at St. Luke's.

Of these, one man in the third stage of phthisis, who had been in hospital several weeks, and was constantly losing ground, suffered much less from sweating the night following his first injection, was entirely dry the third night, had gained a pound and a quarter at the end of the first week, and during the month which has elapsed since, has continued steadily improving.

Another, also in the third stage, who had been seven weeks in hospital, confined all the time to his bed, gained

six pounds in weight during the first fortnight after commencing the treatment, and a pound a week for the three succeeding weeks. In this case an extraordinary improvement of the appetite took place.

Another patient in the second stage maintained his weight while using the blood, but fell off a pound a week for the next three weeks after giving it up.

Another, a female patient, aged 28, entered hospital September 26th; first seen by me November 1st. Phthisis in first stage involving only right apex, but producing extreme constitutional irritation. Pulse 120, temperature high, cough very wearing, appetite entirely gone. Early in November she took to her bed and rapidly lost flesh, color, and strength. Her treatment was arranged with great care to meet as far as possible every indication, but she steadily grew worse. About the first of December she began the injection of defibrinated blood, daily at bedtime. Within a week there was marked improvement. She began to gain flesh, her cheeks regained some color, her appetite returned, and her strength improved so that she sat up a little each day. The improvement continued steadily, and in six weeks she left the hospital, still coughing a great deal and with the physical signs not greatly changed, but much stouter and with a good color, and a fair amount of strength.

In a case reported by Dr. Bayles to the Therapeutical Society, a girl, twelve years of age, with phthisis, used the enemata of blood for a period of six weeks, at the end of which time the night-sweats had ceased, the patient had begun to relish food, the cough had abated, and there had been a gain of four pounds in weight. She then went south, where she continues to improve in strength and spirits.

Case reported by Dr. A. E. M. Purdy. A young gentleman, suffering phthisis in the second stage, came to this city from his home in Chicago, intending to go from here to San Antonio, Texas, for change of climate. He had a diarrhoea supposed to be tubercular, which had resisted all treatment in Chicago, and which became so much worse while here that he was unable to resume his journey. All the means usually employed in such cases were tried by Dr. P. without success. An injection of 45 grams of blood was then ordered twice a day, increased the second day to 120 grams three times a day. In twenty-four hours from that time the

diarrhoea had ceased and constipation was produced. In five days the patient was so much stronger that he started again on his journey.

Case reported by Dr. O. B. Douglas. Patient, a lady 22 years of age. Tubercular deposit in upper lobe of right lung. She coughed badly, was greatly emaciated, had no appetite, vomited frequently, slept but poorly, and had exhausting night-sweats. Pulse 132; axillary morning temperature 38.7 C.; respiration 36. December 8, 1878, ordered 90 grams of blood by enema twice a day. She coughed less and slept better the night following. December 11th, a marked improvement in every particular, especially in her relish for food. Increased the injections gradually to 150 grams twice, and subsequently three times a day. January 13th, the following is noted:

"From a state of great nervous debility and mental depression, without a hope of recovery, the patient has become hopeful and cheerful, coughs less, sleeps and eats better, weight increased five pounds. The discharges seldom show traces of blood, and the odor is never more than ordinarily offensive."

I have treated quite a number of cases of simple anaemia by enemata of blood, and have had excellent results in all but one. In this case I suspect that congenital arterial hyperplasia exists, as the patient has been remarkable from her childhood for her extraordinary pallor. No treatment seems ever to have been of real service to her.

The other cases were, without exception, strikingly benefited, and indeed these are precisely the cases to which the treatment is, theoretically at least, most applicable.

In one of my cases, the patient, aged 23, had had a siege of ague, lasting several months, which had completely broken him down. Anaemic bruit and venous hum were present to a typical degree. Chalybeates were purposely withheld, and enemata of blood administered twice a day. His color rapidly improved, and in a fortnight the bruit and hum had entirely disappeared.

Two other cases in females, both exceedingly well marked, were treated by the injections alone, with only an occasional dose of medicine to meet some passing indication, and made satisfactory recoveries, one of them remaining in hospital only thirty-four days.

The following case is taken from the Transactions of the Therapeutical Society, April, 1878:

Mrs. S., aged 26, was confined three months ago, and suffered from protracted haemorrhage, extending through several weeks. Came under my care March 16, 1878. Is anaemic to the last degree; face tallowy white, lips almost bloodless;

pulse ninety-six and very small; can walk but a few steps at a time; has not been down-stairs since her confinement; complains of shortness of breath, giddiness, and mental confusion; is very despondent; has an absolute disgust for solid food, and vomits it if taken; has been living principally upon beef-tea, milk, and lime-water.

Pepsin and simple bitter tonics were prescribed, with little if any benefit. On the 19th of March began the use of enemata of blood: 120 grams were taken three times a day. Patient retained the injection, the bowels on one occasion not being moved for forty-eight hours.

There was very prompt improvement in strength; within a week she was able to go out-of-doors and walk several blocks. The lips and conjunctivæ regained their color, the stomach became less irritable, the vertigo disappeared, and, in less than three weeks, the only traces of her illness remaining were some shortness of breath when going upstairs and occasional nausea after a full meal.

On several occasions the use of the blood was omitted for a short time, and she immediately felt a decline of strength and spirits.

This patient had been under the care of a very intelligent practitioner for three months before I saw her, and it is fair to presume that the usual means for correcting anæmia had been employed. While under my care she had very little treatment except the enemata, and it seems to me that her improvement is to be attributed chiefly to their use.

A gentleman, aged 68, a Doctor of Divinity, was sent to me in November last by Dr. Webster, for a tormenting cough and dyspnoea, for which he had had a great deal of throat treatment. I found almost complete obliteration of the right pleural cavity, and on inquiry elicited the history of a pleurisy with effusion two years ago.

The lung had been compressed, and was bound by firm adhesion to the spine, so that it could not expand when the effusion was absorbed. The chest was greatly contracted, and the diaphragm so drawn up that the lower border of the liver was nearly on a level with the nipple. The breathing was almost wholly with the left lung. The shortness of breath, due to this cause, was increased by a profound anæmia, the result of the general derangement of health, so that the breathing was between sixty and seventy per minute. The lips and conjunctivæ of the lids were white, and there was oedema of the feet and legs. The appetite was completely gone, and the patient was in about as wretched a plight as possible. Realizing that medicine would do very little toward re-expanding the lung, and that the shortness of breath, which constituted the principal discomfort, was greatly increased by the watery condition of the blood, I recommended no medicine whatever, but only a simple and nutritious diet, and an injection of a teacupful of blood every night. This course he pursued, except that instead of about 150 grams (5 ozs.), which I meant him to take, he divided the very liberal pint which the butcher sent him every second day into two parts, and took in reality each night about 270 grams. This quantity was perfectly well retained, but there was some fluid blood in the evacuation next morning, and the odor from the dejections pervaded the whole house. He improved, however, and in two weeks wrote me that the swelling of the feet and legs was gone, and that the appetite was better. A few days later I saw him, and on learning the quantity of the injections, directed that half the amount should be taken at night and the remainder

in the morning. This did away with the nuisance referred to, and at the next report the breathing was better. He gained decidedly in strength for some time, and finally determined to stop the injections for a week, and see what the effect would be. His last enema was taken Saturday evening, but by the Thursday following he was obliged to renew the treatment. His appetite had left him entirely, and a little food forced down on Tuesday was vomited. He could not sleep, his breathing became again very rapid, and the oedema about the ankles returned. Wednesday and Thursday he ate nothing but a little gruel. His son then interposed, and went himself for the blood, and Thursday evening the treatment was resumed. That night the patient slept comfortably, and when I saw him on Friday morning he had taken with appetite a light breakfast. This was four days ago, and I received a card from him to-day, the 18th, saying that he slept well last night, and was feeling encouraged.

Supplemental rectal alimentation ought, theoretically, to be useful in dyspepsia, whether atonic or depending upon gastritis; in the first case, for the reasons already dwelt upon at length, and in the second, as giving to the inflamed organ partial rest. A case of atonic dyspepsia treated in this way very successfully occurred in my private practice within the past few months. The patient, a young man about 22 years of age, of rigidly temperate habits, began last spring to run down, and soon lost the power of digesting solid food. The smallest quantity taken into the stomach brought on vomiting. He rapidly lost flesh and strength, and his appearance was that of a person far advanced in consumption. There was a good deal of epigastric pain and tenderness, but the pain did not run through to the back, and he had never vomited blood. The tongue was pale and but little furred. This was his condition when I first saw him in December. No medicine was ordered, but he was directed to take a teacupful of blood by the rectum twice a day, and to apply a belladonna plaster over the stomach. The epigastric pain and the vomiting ceased within two or three days, and solid food was taken without inconvenience. In seventeen days he gained eleven and a half pounds in weight.

Dr. George Bayles reported recently to the Therapeutical Society a case of dyspepsia, in which the vomiting was so constant and severe that disease of the pylorus was suspected. For nearly nine weeks he was nourished wholly by injections of bullock's blood, only a little claret and water, toast-water,

or tea with milk, being taken by the mouth. At the end of this time it was found that he gained in weight, and he has had no trouble since from dyspepsia.

The following case of dyspeptic asthma occurred in my private practice.

Mr. R., 30 years of age, partner in a coffee-importing house, of weakly frame, but possessed of intense nervous energy and a ceaselessly active temperament, his attention closely devoted to business, has been for some years subject to frequent and severe attacks of dyspeptic asthma, which leave him greatly prostrated. He often scarcely recovers from one attack before another comes on. This was his condition in the early part of last summer. Whatever good effects drugs may have produced seemed to be exhausted. I had tried every possible line of treatment, and in his frequent business trips he had consulted many other physicians in other cities. But with the demands which his business made upon him, it was scarcely possible that permanent good could result from any medication. Still, with the hope of enabling him better to withstand the wear and tear during the hot season which was approaching, I ordered for him injections of blood twice daily. He gradually increased the quantity until he had used 480 grms. (1 pint) a day. The treatment resulted in a prompt and decided improvement in all his symptoms. His appetite, which before was capricious and irregular, became excellent, and although he continued at his business through all the hot weather, sleeping in town, and taking his meals at restaurants, he gained about eight pounds in weight, and enjoyed complete immunity from asthma. Finally, however, he got to be troubled with severe constipation, notwithstanding the amount of fluid thrown into the bowel daily, and the annoyance from this induced him to give up the treatment. Since then he has held his vantage ground in part, but he is slowly slipping back into his former condition.

The following is one of my cases transcribed from the records of St. Luke's Hospital :

Patient, William T., four and a half years of age, was admitted October 21, 1878. For five or six months had been running down without assignable cause. Examination shows extreme emaciation, anæmia, enlarged liver, veins of abdomen injected, and stomach distended. Ordered : syr. ferri iodid. ; ext. of malt.

November 1st.—Improving in general appearance.

January 1st.—For some days patient has been vomiting nearly everything taken into the stomach. Ordered milk diet.

January 23d.—Not materially improving, though vomits less frequently. Patient weighs 8.5 kilos. (23 lbs.) without clothes. Ordered, enemata of defibrinated beef blood, 60 grms. ($\frac{2}{3}$ ij.) t. i. d.

January 31st.—Weighs 9.1 kilos. (24 $\frac{1}{2}$ lbs.); looking much better; running about the ward.

February 8th.—Weighs 9.44 kilos. (25 $\frac{1}{2}$ lbs.). Lips red; cheeks filled out and rosy; abdomen less distended; and in every way patient looks a healthy child.

If neuralgia is, as Romberg has elegantly expressed it, "the prayer of a nerve for healthy blood," it should offer a promising field for the treatment in question.

My own experience on the subject is very small and inconclusive. Dr. Bayles, however, has reported to the Therapeutic Society two cases of inveterate neuralgia, apparently inherited, which were greatly relieved in this way. The paroxysms were rendered much shorter and less severe. Both patients increased in weight, one 1.85 kilos. (5 lbs.) in six weeks, and the other 1 kilo. in the same time.

The following case of nervous exhaustion is from my private practice :

Patient, a lady aged about forty years. Constitution broken six years ago by prolonged ulceration of the rectum and fistula in ano. Has had frequent attacks of dysentery since. Last winter was sick for three months with a low nervous fever, which left her in a state of extreme debility. She had pain and tenderness in the epigastrium, no appetite, insomnia, giddiness, palpitation, tinnitus, and spectral illusions. Ordered 150 grams (5 oz.) of blood by enema twice daily. This produced an immediate effect. The epigastric pain and tenderness disappeared within a few days, and sleep and appetite returned. The giddiness and palpitation soon ceased, but the tinnitus and spectral illusions continued for several weeks. In a month she had recovered so much strength that she could row for a short time each day. No medicine was taken. She returned to town in October much improved in flesh and better than she had been for years. She was then subjected to a great drain upon her strength in settling a new house, and in the midst of it had one of her attacks of dysentery. This was promptly checked, but it left her with many of her former symptoms. She resorted again to the enemata, with immediate and marked benefit, and in three or four weeks, although surrounded by very unfavorable influences, she regained all she had lost.

The following case can scarcely be called one of *supplementary* alimentation by the rectum, since the stomach did almost nothing; but it is introduced here to show the nutritive value of blood as a material for injections, and what may be accomplished with it, with almost no aid from the stomach.

Paulina S., about 18 years of age, patient at St. Luke's Hospital, entered July 22, 1878, with some pulmonary trouble. Soon after developed symptoms of gastric ulcer, and was kept for a long time on milk diet. Finally, even this was rejected, and for two weeks previous to the first of November she had been nourished entirely by enemata of desublimated blood, ordered by Dr. Wheelock.

At first she did well, but after a few days began to fail, and when I saw her she was apparently moribund. She was in a state of semi-consciousness, lying with the eyes half open, the corneaæ glazed and the conjunctivæ injected, the tongue dry and the teeth covered with sordes, presenting the appearance of a person in the last stage of typhoid fever. The pulse was barely perceptible. She was then receiving by injection 90 grams (3 ozs.) of blood every three hours, and 30 grams (1 oz.) of brandy. On inquiry, it was ascertained that the blood and brandy were mixed and injected together, thus causing coagulation of the albumen, and unsifting the blood for absorption. This was corrected, the blood being given alone, and an occasional teaspoonful of brandy and milk being administered by the mouth. The following day I found an astonishing improvement. Complete consciousness was restored, the countenance was bright, and there was a pulse which, though very frequent, could be easily counted. From this time recovery progressed rapidly. Brandy and milk were allowed in small quantities by the mouth, and gradually other things were added, until at the end of two weeks she was placed on full diet, and on Dec. 11th was discharged cured.

Case reported by Dr. Hanks.

Patient, Mrs. B., U. S., age 33 years, mother of two children. Has never been rugged, but has generally been able to superintend her household. Has always been of a pale complexion, but has had a good appetite, and slept well.

July 29, 1878.—I was called to prescribe for her on account of a profuse and long-continued menstrual flow. I found her extremely weak, and apparently nearly exsanguinated, with a rapid, feeble pulse of 110; temperature, 37.7° C. (99°); respiration, 24. A constant flow of thin red blood from vagina. This has continued for one week. Her last menstrual flow was also of long duration.

The uterus was found retroverted in the second degree. The displacement was corrected, and warm salt-water injections *per vaginam* were ordered. On the following day the flow still continued, and the patient was hardly able to raise her head from the pillow without fainting.

Pulse still rapid and feeble, temperature normal. A liberal allowance of brandy was ordered, and aromatic sulph. acid and morphine in small doses.

August 1st.—Same condition; pulse, 120; temperature, 38.3° C. (101°); vomits all food taken; ordered 120 to 180 grams (4 to 6 ozs.) of fluid beef's blood *per rectum*, three times per day.

August 2d.—Pulse and temperature the same. Patient looks and feels better. Injections have caused no pain or uneasiness. Same treatment to be continued.

August 5th.—Patient improving, same treatment.

August 13th.—Has continued the injections of blood until to-day. Has taken some food *via naturalis*, during the week. Has improved steadily during the use of the injections.

I might add many other cases in which the success of this method of alimentation has been more or less striking, but I will not occupy more of the time of the meeting. I cannot

close better than by quoting from a recent report of the Committee on Restoratives of the Therapeutical Society.

The report concludes as follows :

“ From the facts before them the Committee feel warranted in the following conclusions :

“ 1. That defibrinated blood is admirably adapted for use for rectal alimentation.

“ 2. That in doses of 60 to 180 grams (2 to 6 ozs.) it is usually retained without any inconvenience, and is frequently so completely absorbed that very little trace of it can be discovered in the dejections.

“ 3. That, administered in this way once or twice a day, it produces, in about one-third of the cases, for the first few days, more or less constipation of the bowels.

“ 4. That, in a small proportion of cases, the constipation persists, and even becomes more decided the longer the enemata are continued.

“ 5. That in a very small percentage of cases irritability of the bowels attends its protracted use.

“ 6. That it is a valuable aid to the stomach, whenever the latter is inadequate to a complete nutrition of the system.

“ 7. That its use is indicated in all cases not involving the large intestines, and requiring a tonic influence which cannot readily be obtained by remedies employed in the usual way.

“ 8. That in favorable cases it is capable of giving an impulse to nutrition, which is rarely, if ever, obtained from the employment of other remedies.

“ 9. That its use is wholly unattended by danger.”

RECTAL ALIMENTATION IN THE NAUSEA AND
INANITION OF PREGNANCY—INTESTINAL IN-
HAUSTION AN IMPORTANT FACTOR AND THE
TRUE SOLUTION OF ITS EFFICIENCY.¹

BY HENRY F. CAMPBELL, M.D.,
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THE introduction of nutrient materials by the rectum, in various conditions of obstruction or of other disability in the upper portions of the alimentary canal, has of late been somewhat widely discussed. In the present paper, I propose to consider it briefly in one of its most obvious applications, which, it appears to me, considering the comparatively frequent demand for it, has received but slight attention. Neither in recent disquisitions, nor in the references made to it in standard works, do we find more than a secondary importance given to rectal alimentation as a reliable means of sustaining life in the dangerous condition to which women are brought by the persistent and uncontrollable vomiting of the earlier months of gestation. The condition of the patient, in the severer cases, has ever been regarded as one for grave consideration. We scarcely ever encounter in books, however, any representation which portrays the hopeless suffering of the patient, as it will be found in the recollections of any one who may have had the misfortune to see death by starvation threatening his patient and her unborn offspring, while he, with futile efforts, tries to stay the progress of the hunger and emaciation which seem steadily, day by day and hour by hour, to be taking them to the grave.

I will not delay this meeting with the detail of authorities. It is sufficient here to remind the Fellows present that a state so hopeless is often enough arrived at, from the nausea

¹ Reprint from the Transactions of the Gynecological Society for 1879.

and inanition of pregnancy, to constitute it, in the minds of a large proportion of our profession, one of the very few conditions which authorize—nay, which make it the imperative duty of the obstetrician, to sacrifice the foetus by induced abortion, as the only means of saving the life of the mother.¹

My single purpose now is to present "Rectal Alimentation," as it has been aptly designated, as finding in the nausea and inanition of pregnancy a fuller and more frequent application than in any of those conditions of stomachic disability so frequently discussed, or than has heretofore been distinctly recognized by the profession even when treating of the measure as an expedient of nutrition;² and further, to call attention, by an illustrative case, to the efficiency of the measure, and to the rationale of its success. In the recent discussions of the subject, such as occurred in the New York Academy of Medicine last year, most valuable information in regard to rectal nutrition in its general application was elicited; and in the communication made by Dr. Austin Flint will be found perhaps the largest collection of cases to be seen in any one paper. The perfect efficiency of the method is there shown. Nutrition was maintained in a number of patients, ranging in time from three weeks to five years—the majority of them by rectal diet alone; while in others, buccal ingestion constituted so inconsiderable a part of the supply as in no way to vitiate the assumption that "life may be sustained indefinitely solely by rectal introduc-

¹ "The subject of excessive vomiting in pregnancy, involving the life of the mother, has recently attracted much attention. In 1852 there was a remarkable discussion in the French Academy of Medicine, embracing more particularly the question—Is it ever justifiable to induce abortion in cases of excessive vomiting? The discussion grew out of a report submitted to the Academy by M. Cazeaux, and there was much conflict of opinion on the subject, the ultimate decision being of a mixed character. It is conceded that pregnant women have occasionally died from the effects of vomiting; there are some striking instances recorded, and I am quite sure the unrecorded experience of practitioners could furnish many more examples."—*Principles and Practice of Obstetrics*, by Gunning S. Bedford, A.M., M.D., New York, 1866, p. 671.

² Dr. Austin Flint, in a most instructive communication on *Rectal Alimentation* (see *American Practitioner*, January, 1878), though presenting a list of the conditions in which it may be applicable, does not once refer to the nausea and inanition of pregnancy.

tion of aliments." Suggestions as to its applicability to the nausea and persistent vomiting of pregnancy were incidentally made by distinguished Fellows of the Society.¹

In a hasty review of the subject, I find that many authors who regard excessive nausea and vomiting as very serious, still do not even mention rectal nutriment, while some who do refer to it attach little importance to it. Dr. Davis, of London,² says: "It has been attempted to convey nutriment to patients incapable of receiving any through the stomach, in consequence of its being instantly rejected, by the absorbents of the skin, by means of rubbing milk, etc. ; more nutriment, however," he continues, "may be introduced into the system by clysters." Its association here with "rubbing milk into the skin" certainly gives us no very high idea of his estimate of the value of "nutriment by clysters."

Moreau says: "If vomiting be very frequent, it occasions pain and an agitation which, in some instances, may oppose the progress of pregnancy and produce abortion; at other times it interferes with the nutrition of the woman, and gives rise to emaciation and consequent irritability which, in some rare cases, may prove fatal." He gives elaborate directions concerning medication and nutriment, but does not mention the rectal administration of either among his expedients. In his discussion of the severer cases, M. Cazeaux devotes an unusual number of pages to the subject; he dwells at length upon the apparent extreme danger of some cases, suggests every expedient by which stomachic nutrition may be maintained, and his especial horror—induced abortion³—avoided, and yet he does not mention nutrient injections among them. Dr. Hodge⁴ also abounds in remedies and devices to arrest the exhausting and distressing symptoms of this complication of pregnancy, but makes no reference to rectal ali-

¹ Dr. Fordyce Barker and the late Dr. E. R. Peaslee.

² *Obstetric Medicine*, London, 1836, p. 860.

³ According to his estimate, one in seven is the average of escapes from death after the operation. He thinks the most desperate case, as he cites several to show, has a better chance on the expectant plan, with such nutriments as can be retained, than in the resort to induced abortion. *Op. cit.*, p. 277.

⁴ *Principles and Practice of Obstetrics*, 1866.

mentation. Dr. Elliott,¹ however, in the report of a fatal case in which the induction of premature labor was practised, says: " Supporting treatment was resorted to by the mouth and rectum ; but she steadily lost ground from the date of her admission."

Leishman² expresses himself as follows: " In some cases where the irritability of the stomach seems merely to be increased by food and drink, it will be proper for us to sustain the powers of nature by nutritive enemata ;" but he, like Davis, again lessens our idea of his confidence in the measure by adding, " and, availing ourselves of the probability of ingestion by the skin, we may give warm baths to which gelatinous matter in any form may be added ; or inunction, by means of cod-liver or other oil, may be practised."

Neither time nor the scope of these remarks will allow of further rehearsal of the estimate put by authorities upon this expedient.

I have for many years regarded nutrient enemata as a valuable *stand-by* in all cases in which the ability to take food naturally was, from any cause, long delayed, and among these have recommended the measure for short periods, in the severer cases of gravid nausea.³ In many of these cases there was no particular danger of inanition, but the expedient was suggested by me to relieve the stomach, and to supplement for a while the deficiency in its supply of nutriment to the system. Among common cases, I can refer to one of paralysis in the muscles of deglutition, from diphtheria, where rectal nutrition had to be exclusively relied upon for many weeks, until the disability subsided ; and another of constriction of the fauces from traumatic tetanus, in which, though fatal, the patient himself (the late George M. Newton, Professor of Anatomy in the Medical College of Georgia) proposed the operation of oesophagotomy, but was for many days relieved of the pangs of hunger and thirst by the ingestion of beef-tea and water by the rectum. Another case, which I

¹ *Obst. Clinic*, 1868, p. 167.

² *System of Midwifery*, 1875, p. 222.

³ The term "gravid nausea" is here adopted for its brevity.

have not seen referred to in any recent discussion, is that of Dr. Marshall Hall, of London. Though suffering from an obstructive cancerous affection of the cesophagus, he yet, with a noble zeal, continued his labors during many months, in which he was physically sustained almost entirely by nutrient enemata.

In my own experience, as I have just said, rectal alimentation has not been by any means always applied as a *dernier ressort* in hopeless cases, but as an expedient for supplementing inadequate nutrition by the stomach. An injection of beef-tea once daily has been in many cases a preventive of that exhaustion and extreme emaciation which I am certain would otherwise have resulted.

But few extreme cases of gravid nausea and vomiting can be expected to occur in the experience of any one physician, and still more rarely does it happen that the opportunity for daily personal observation is afforded throughout the continuance of a case. The following somewhat prolonged case—over six weeks—is the occasion of the present communication, and I shall therefore present in detail the result of my observations—more especially such as relate to the sustenance of the patient by rectal alimentation :

Gravid Nausea—Nutrition maintained for Fifty-two Days by Rectal Alimentation alone.

August 24, 1875.—Mrs. C. M. H., aged about twenty-nine years, had been for some time irregularly under my treatment. She had expressed apprehensions that conception had occurred. She greatly dreaded the condition, on account of the suffering she had endured in a previous pregnancy, which had been marked by considerable nausea; but especially did she fear it because her life had been despaired of from anasarca, at about the fifth or sixth month. At the present time she had lost her appetite, vomited nearly everything she ate or drank, and was feeble and emaciated, though she had not as yet confined herself to the house.

On the 28th of August I was called to see her, and found that she had eaten nothing for several days, and that her suffering from nausea was very distressing. The pulse was feeble and irritable; though she had taken neither food nor drink, I found her vomiting large quantities of a glairy fluid from the stomach. Owing to her utter incapacity to take food, and her rapid emaciation, I regarded the case with unusual apprehension, and saw at once that I had no ordinary “morning sickness” to deal with, but a case of the most intractable character. Nutritive enemata of ordinary beef-tea, with the addition of Borden’s condensed beef, were systematically administered from this time.

Her stomach showed such irritability that medicines by the mouth, no less than food, were plainly out of the question. Soda-water, champagne, "Potion de Rivière," and oxalate of cerium, had all been tried in vain. I had also applied a blister to the epigastrium, without in any degree modifying the symptoms. Morphine and atropia were given subcutaneously to quiet nervousness. Suspecting gravid displacement of the uterus to be the cause, postural pneumatic replacement of a moderate degree of retroversion was readily and repeatedly accomplished, but no relief afforded. Finding that leucorrhœa was profuse, I decided on a specular examination, hoping to discover in the condition of the cervix some adequate excitor of the exaggerated hystero-neurosis of the stomach.¹ From some circumstance this lady's husband and his family had acquired some vague knowledge of induced abortion as a "sure and safe expedient for the relief of the nausea of pregnancy," and before I had myself admitted so despairing an idea, it was urged upon me by them with much persistency. I now requested consultation with Professor Joseph A. Eve, for, though she retained all the rectal nutriment, and also water administered two or three times a day in the same way, the nausea was but little abated. Small lumps of ice or teaspoonfuls of water, when taken to relieve the unpleasant taste in the mouth, often caused her to vomit half a basinful of the glairy fluid secreted by the stomach, sometimes mixed with bile and often with bluish flocculi. I desired that Dr. Eve should be present at the specular examination, so that in case abortion were determined on—which I did not favor—the process might be begun at that time.

September 20.—Examination detected general redness and tumefaction of the vagina and cervix. There was a large collection of leucorrhœal fluid in the speculum. We at once discovered a considerable superficial but well-defined ulceration near the os. The edges of the ulcer were somewhat ragged, and the surface was covered with a whitish curd-like deposit, through which red bleeding granulations could be seen. This erosion encroached somewhat upon the external os, occupying one side of the canal to a slight extent. Dr. Eve and I both abandoned even the slight idea we had entertained of induced abortion, feeling assured that in this angry and irritable erosion we had discovered the cause of the nausea and vomiting, as confidently asserted by Dr. Henry Bennett to be the invariable provocative in nearly all cases.

This surface was freely cauterized with the solid nitrate of silver; but, I am sorry to say, with no perceptible immediate effect upon the reflex gastric phenomena.

Besides the repetition of the blister over the epigastrium, the expectant plan, with, if possible, a more regular and systematic application of the rectal nutriment, was the result of our conference. The failure of cauterization and the continuance of the gastric distress, though I felt confident of her pretty satisfactory well-doing upon rectal alimentation alone, caused the family again to urge

¹ "I am persuaded," says Dr. Bennett, "that those gastric disorders and obstinate vomitings which so often bring women to the portals of the tomb are almost always caused by inflammatory ulcerations of the neck of the womb." "For my own part," he adds, "since my attention has been directed to the subject, I have *almost invariably* found ulceration of the neck in cases of this kind."

the measure of induced abortion. Prof. L. A. Dugas was now added to the consultation.

September 26.—The patient had for some few days past vomited less of the fluid secretion—she had not pretended to take either food or drink—and appeared more comfortable. She had always retained the rectal nutriment without difficulty—seldom requiring the addition of any opiate, as at first. She was somewhat more cheerful than heretofore, though she could not sit up a moment without retching. On examination with the speculum, the erosion was found in a healing condition, and it was decided not to repeat the application of nitrate of silver. Tepid injections of water were daily applied per vaginam. The measure of induced abortion was fairly considered, but there was no disagreement as to its rejection—especially as we had some reason, though there was neither motion nor fetal heart-sounds perceptible, to believe the fetus to be alive. The very large percentage of fatal results from the measure under the circumstances of our case was, of course, the more cogent reason determining us to adhere to the expectant plan and to depend upon rectal alimentation. We all agreed that the evidences of an adequate nutrition by the rectal introduction of food were amply sufficient to warrant us in relying upon it to secure her from any danger of fatal inanition.

October 4, 10 A.M.—From August 25th to the present time, Mrs. H., though frequently distressed with nausea and unwilling, and, I believe, unable to take the smallest amount of nutriment or drink without provoking immediate vomiting, improved in color, increased apparently in flesh and strength, slept well, being scarcely ever awakened by the gastric disturbance. She was also more cheerful, but said she feared she should always be obliged to take her food in this unnatural way. "She never expected to eat again."

October 4, 4 o'clock, P.M.—At this hour Mrs. H. began to complain of lumbar and uterine pains. Being sent for, I found abortion in progress, though at my morning visit there had been no such indication; the os uteri was well dilated; there was no sanguineous flow. A dead fetus of three and one-half months was soon easily expelled. The womb apparently contracted well.

Contrary to all our expectations and hopes, we found that the nausea was in no degree abated by the evacuation of the uterus. In reflecting upon this case subsequently and from the appearance of the fetus, I have concluded the latter must have been dead for some time previous to expulsion. The continuance of nausea before the abortion was one of our grounds for supposing the fetus to be alive; but all the circumstances, as developed subsequently, rather militate against this supposition.

According to memoranda carefully kept by her husband, Mrs. H. continued to be distressed with nausea and to be nourished solely by the enemata for fourteen days after the expulsion of the fetus, and for a much longer period this had to be continued as supplementary to her very gradually returning power to take and retain food by gastric ingestion.

During this time she improved rapidly in flesh and in color. We at this time added a solution of tartrate of iron and potassa five grains, quinine five grains, and sometimes stimulants to the nutrient injections.

Method of Rectal Alimentation in the above case.

By reference to the note recording the beginning of rectal nutrition in this case, it will be seen that on the 27th of August, in order to inaugurate properly this method of nutrition, I began by administering the first enema in the presence of the attendant. This consisted of beef-tea or beef-essence. For gastric ingestion this fluid is skimmed and decanted, so as not to offend the taste of the patient by the oil or the sediment, the clear fluid only being given. In my use of it for rectal administration, the settling and also the oily particles are retained, in order to render the ingestion more nutritious. In addition to the beef-essence, I added to each injection of eight ounces one teaspoonful of Borden's, or Liebig's, or sometimes Valentine's, condensed preparation of meat.

There are various opinions as to the nutrient properties of ordinary beef-tea, and therefore the condensed preparation in some of the above forms was always added to insure a *double chance* that our rectal food should possess adequate nutrient elements. Other articles were at times added, such as rice-water, arrow-root, jelly, gruel, etc., blanc-mange, custard, whipped cream, etc., and used as found convenient, but always with the beef-tea strongly made.

On the application of the first injection—an ordinary tumblerful of beef-tea—there was some tendency to evacuation, continuing but a short time, when the bowel was rendered tolerant by a pressure against the levator ani.

Notes on the Process of Administration.

The mixture above described was that ordinarily used in the case. A large gobletful—at least half a pint—perhaps ten ounces, was injected twice daily. The propulsion of the fluid was very slowly and gently made till the vessel was entirely exhausted. By care in excluding the air, there was seldom any danger of losing an enema, large as they were, and I cannot remember a single occasion during the treat-

ment in which an entire injection was lost. In addition to the nutriment thus given, the *drink* of the patient was represented in the rectal administration of water with or without the addition of wine or brandy, as appeared suitable to the condition and feelings of the patient. During the interval of the morning and evening injections a full goblet of water, not quite cold, was twice given, some hours apart.

In addition to the records above presented, such as the generally beneficial effect of the rectal ingestion of food, etc., there are certain observations which I have reserved for separate mention, intending to discuss but one of them at any length.

First.—That the rectal aliment seemed always, as has been observed in other reports of cases, to relieve the patient of the feeling of hunger and "sinking" in the epigastrium which often marks prolonged abstinence, and from which she sometimes suffered when the injection was delayed. The injection of the water, often called for by the patient on account of the dryness of the mouth and fauces—increased, I suppose, by the atropia and morphine—also relieved her thirst promptly, as well as the dryness in the mouth, for hours at a time.

Secondly.—*The alvine discharges* were quite natural—"figured passages," though by no means regular; they generally occurred once, or at most twice, during the week. In no instance that they were examined was there found any trace of the articles used for nourishment. The discharges were, when iron was not used, properly colored with bile, and always solid. The amount of faecal matter passed was much less than the average of health.

Thirdly.—The urine, which was not tested, either as to its specific gravity or its constituents, was somewhat less, I should think, than that of health, generally of rather a pale amber color, but sometimes dark and reddish. There was no irritability of the bladder or vesical mucus. The large quantity of fluid sometimes vomited may possibly have caused a diminution in the amount of urine.

Fourthly—*Intestinal movements.*—For a very large portion

of the time during which this patient was under treatment, emaciation was extreme, and the abdominal wall very thin, thus affording the best possible opportunity for observing the effect of the introduction of aliments upon the intestinal canal. On the completion of the injection, more or less gurgling within the abdomen, and some obscure movements of the intestines, were often perceptible. At first this was regarded as an indication that the nutritive enema was provoking peristaltic action, which might cause it to be expelled. On several occasions I inquired of the patient if she felt any uneasiness indicating the loss of the injection. Her answer at first surprised, but also satisfied me as to the perfect safety of the retention: "No, doctor; that sound and movement always follow the enema; they are sometimes perceived at once, and sometimes later, but I always feel easier after that rumbling takes place. I think it is the beef-tea going up into my bowels, for, after that, I never feel any disposition to pass it off." Daily personal observation fully convinced me of the fact that the movement was an upward one. It continued sometimes for more than an hour in a less obvious manner, as was noted by the patient and an intelligent relative in constant attendance. "Upon this hint I speak," for upon this observation, and the interpretation I hope legitimately to give it, mostly depends the principal value of the case, in the discussion of the rationale of rectal alimentation. I shall refer again to it as the evidence of reverse peristalsis, or, as I would prefer, retro-stalsis, which, as will be seen hereafter, I can but regard as a most important, though heretofore unrecognized factor in the efficiency of all the devices for rectal feeding.

MR. PRESIDENT—It has been neither for the purpose of reporting a case of but moderately prolonged sustenance by rectal nutrition, that I have presented this paper to the Society; nor as a mere novelty have I detailed the phenomena as observed by me for over seven weeks. There are on record, as we have seen, many cases affording equal, and some of them much more striking proofs of the adequacy of rectal alimentation to sustain life over protracted periods of time. Three months, twelve months, three years, and even

five years,¹ have passed during which persons have been nourished by food introduced solely from this direction. These were cases in which, as in my own, there was no other possible avenue by which pabulum could find access to the blood. My object has been far different, and my endeavor more comprehensive. I have desired to present certain relations in which, in this case, I have been afforded the opportunity of studying phenomena that might transpire unobserved and uninterrupted during years of successful rectal feeding. I desire to awaken the interest of others—to elicit impartial discussion upon the obscure and heretofore little explored field of research that pertains to the physiology or rationale of rectal nutrition.

The little importance attached to this method of ingestion until a very recent date, has, I think, been principally due to two prominent causes, or rather *methods of reasoning* upon the subject :

First.—As the rectum and even the colon are comparatively devoid of lacteal vessels, much incredulity exists as to their power of absorbing and carrying to the blood aliment in any degree adequate to the sustenance of life.

Secondly.—Even were the rectum abundantly possessed of lacteals, and endowed with the most active powers of lacteal as well as of venous absorption, neither of these modes of ingress could be utilized, on account of that thorough disintegration and solution, so indispensable to nutrient absorption and assimilation, being entirely deficient in the absence of those chemico-vital “*digestive fluids*”—the gastric juice, the bile, the pancreatic juice, and, perhaps, the secretions of the small intestine, so necessary to the solution, attenuation, and proper elaboration of alimentary matters preparatory to their absorption into and admixture with the blood.

I have thus enumerated but two of the more common and obvious objections that have been made (though I do not know that they have been anywhere formulated) to rectal

¹ Most of these will be found referred to in the discussion before the New York Academy of Medicine, and given more fully, perhaps, in Dr. Flint's paper, “*Cases Illustrative of Rectal Alimentation, with Remarks*,” in the *American Practitioner* for January, 1878.

assimilation and absorption. I fear, however, a more extended examination of the intimate structure of the lacteal absorbent apparatus—of the essentials to, and modus of, lacteal and venous absorption as they are effected in the villi, showing each one to be a highly organized and elaborately constructed absorbent gland, so to speak, with a portal radicle and lacteal ramus in its centre; these also thickly studding the mucous membrane down to the ileo-cæcal valve, where they abruptly disappear; and finally, the extent of this mucous membrane greatly increased by valvulae conniventes to retard the progress of the chyle, and to offer surface and facility for the double absorption of the prepared fluid. I repeat, I fear that such a study would rather increase than relieve the difficulties of faith in regard to rectal assimilation and absorption. Such considerations would be calculated to cause the direct entry from the rectum into the blood of composite and unelaborated aliments, to be regarded by many as a physical impossibility and a physiological absurdity. This is the apparatus, however, and such as briefly sketched are the conditions upon which intestinal digestion and absorption depend.¹ Now, in nearly all of these requirements the large intestine is totally deficient, though it has a most abundant supply of portal radicles. By these, water and thin solutions of nutriment are most undoubtedly absorbed and carried into the portal circulation for hepatic digestion, and for distribution thence to the system.² "So long ago as 1824," says Murchison, "it was shown by

¹ F. W. Pavy: *Treatise on the Functions of Digestion: its Disorders and their Treatment*, p. 170. From Second London Edition. Philadelphia, 1869.

² In some experiments on a case of large artificial anus, by Dr. William Hunt, it was found that bits of meat placed in the colon or cæcum had no digestive effect produced upon them. Medicines placed in the cæcum and colon were inert. It was concluded that neither the cæcum nor colon had any digestive power whatever.—*Pennsylvania Hospital Reports*, vol. ii., 1868.

In a paper by Prof. Joseph Jones, of New Orleans, published by the Smithsonian Institution, that distinguished physiologist gave his experiments on various animals to determine the influence of starvation upon sanguification. In the American "gopher," large masses of grass and other crude nutritious matters, in the colon of this chelonian, seemed to keep up nutrition and sanguification, the colonic deposit serving as a store of nutrition to prevent emaciation.

Magendie and Tiedemann that the absorption of nutritive matters from the bowels was not limited to the lacteals, but that part was taken up into the blood by the portal vein,"¹ etc.

Then, notwithstanding the simplicity of its structure as compared with that of the mucous membrane of the small intestine, there can be little doubt of the capacity of the rectum to absorb a considerable variety of substances—as medicines and also aliments—and to furnish, it may be, a moderate supply to support nutrition through vascular and membranous absorption. A method of food-ingress, by which the entire vegetable kingdom and the invertebrate department of the animal kingdom² are supplied from the external world, must, with logical certainty—as it has been by experiment demonstrated—be retained by man and the higher vertebrata, notwithstanding their additional endowment with lacteals and an elaborate special apparatus for the absorption of external aliments. I think we may believe, then, that a very considerable portion of the aliments entering the system from food placed in the rectum is quite often taken in by venous absorption through the portal radicles, whence it is carried to the liver for digestion,³ blood-mixture, and blood-making. But that this is the *only* avenue, or that it is through this channel of the rectal blood-vessels that the most abundant supply of rectal pabulum is carried to the blood, I think may be denied with the most positive confidence, and its converse established by irrefutable demonstration, as it will in time be by actual experiment.

¹ Op. cit., p. 8.

² "The proper absorbent system is exhibited in its most simple and diffuse form in *fishes*, the lowest class in which its existence has been demonstrated."—*Principles of General and Comparative Physiology*, by W. B. Carpenter, p. 661.

³ Dr. Murchison, in his Croonian Lectures, says that "in the first half of the seventeenth century the liver was the centre of sanguification," and he strongly advocates its reinstatement to that position, now that the modern advances in physiology confirm that view.

INTESTINAL INHAUSTION.

There is, in my opinion, as I have already intimated, another, which is by far the most important method by which the solution, elaboration, assimilation, absorption, and final introduction of rectal food into the body is vastly promoted. It is the one first suggested to me by the observation and study of the case, the report of which I have made to-day; but the force of the conviction, at that time impressed, has been strengthened by reflection, and more especially by innumerable observations of daily experience which have borne directly upon it. This valuable adjunct and promoter of rectal alimentation, the existence and value of which I hope plainly to show, depends upon what has been variously termed by different writers "reversed peristaltic action"—"inverted peristalsis"—and by Copeland and Pavy, and perhaps many others, "anti-peristaltic action" of the muscular coat of the intestine. I prefer to change these terms to one more directly indicating the result, more significant of the part it plays as auxiliary to rectal feeding—I shall define this well-known action as "*Retro-stalsis*."¹ I hope to show that by it the nutrient materials injected into the bowels are, in a shorter or longer time, carried up out of the rectum, and made to reach the portions of the digestive canal, where all the conditions of normal intestinal digestion may be fully met, and where, on account of it, the process can be as effectually accomplished as though the aliment had arrived there by buccal instead of by rectal ingestion. This process, or function, or vital action of co-ordinated and continuous retro-stalsis, is to the rectum and small intestines what deglutition is to the œsophagus and stomach. For the want of a more appropriate designation, I propose that it shall be called "**INTESTINAL INHAUSTION**."

No physiologist of the present day, however fully impressed with the wonderful capabilities of venous and mem-

¹ From *retro*, "backward," and *στέλλω*, "I send." "Prostalsis," from *πρό*, "forward," and *στέλλω*, "I send," is also proposed as another term briefly indicating the *direction* of intestinal action.

branous absorption, can feel perfectly satisfied that these alone and without the intervention of some other factor wanting in the rectum, can rationally and adequately account for the success and apparent perfect efficiency of rectal alimentation as reported in journals, and here and there in some works on practice.¹ Especially is our ingenuity taxed in the presence of such cases as those discussed before the New York Academy of Medicine, and in the recent collection by Dr. Flint.² If absorption could account for the disappearance of the injected pabulum from the rectum, and the sustained nutrition of the patient, how are those indispensable prerequisites to the introduction of food into the blood, viz., digestion, solution, homo-genification, peptonification, to be accounted for in a cavity devoid of every one of the digestive principles requisite to accomplish these acts, and also unprovided with the secretory apparatus by which only they could be supplied? In a question of such perplexity, as it is both interesting and instructive, I will quote, without much comment, the language of Dr. Flint (who, of course, recognizes no digestion as taking place, *per se*, in the large intestine) in dealing with this dilemma:

"With reference to this inquiry (about articles of rectal diet), I cannot pass by the physiological question. How is digestion in the large intestine effected? From its failure to procure from the mucous membrane of the colon and rectum a digestive juice, and from experiments on lower animals, physiologists have been led to doubt the ability of these portions of the alimentary canal to perform the function of digestion. Yet secreting glands analogous to those of Lieberkühn are found in considerable numbers in the large intestine, and it is not difficult to understand that they may take on a vicarious activity when the glands of the stomach and small intestine are not excited by the presence

¹ Leube denies the possibility of rectal nutrition, unless the food has been first artificially digested. Pancreatic emulsion, prepared by him for the use of disabled stomachs, has been used by Flint and others as rectal food.—Ziemssen's *Cyclop.*, vol. vii.

² Loc. cit.

of ingesta. This supposition is not inconsistent with the absence of digestive juice in the large intestine when digestion in the stomach and small intestine is not interrupted."

So indispensable does the admixture and modifying influence of the digestive fluids of the small intestine very properly appear to Dr. Flint,¹ that, in addition to the ingenious though scarcely admissible suggestion of their supply by vicarious secretion in certain minute glands of the large intestine, he advances still another possible method by which the digestive chemistry (which by these fluids can alone be effected) is to be secured to the alimentary mass to be assimilated in the large intestines. He thus clearly enunciates his second proposition: "Another supposition which I will venture to make is, that food introduced into the rectum excites secretion by the gastric and intestinal glands, and, in the absence of ingesta in the stomach and small intestine, the fluids secreted by these glands pass into the large intestine in sufficient quantity to effect digestion within the latter."

I have already defined the method by which I account for the digestion, absorption, and assimilation of food when placed in the rectum. It is this—differing from all others with which I am acquainted—that digestion in either rectum or colon is not at all contemplated: neither by direct absorption on the part of the walls and vessels of these cavities; nor by the means of artificial digestive principles added to the food, after the manner of Leube; nor by the glands of the large intestine vicariously secreting the digestive fluids of the small intestine; nor, lastly, by the alimentary mass in the large intestine exciting the secretions of the stomach and small intestine, and then attracting or in some way acquiring them in order that rectal digestion may take place. My proposition is distinctly the reverse of this last, and asserts that,

¹ A Fellow of this Society—Dr. J. R. Chadwick, of Boston—proposes, in desperate cases, to inject with the aspirator through the abdominal walls nutrient fluids and stimulants into the small intestine, "that part of the alimentary canal from which they will be most readily absorbed."—*Am. Jour. Obst.*, viii., 399, November, 1875.

instead of the digestive principles descending to the food to digest it, the food ascends to these fluids in the small intestine, and that it is there digested and prepared for absorption by the proper organs in precisely the same manner as after buccal ingestion.

Facts of Observation.

In substantiation of the important proposition thus enunciated, there are many facts both of observation and experience which will give support to my belief. Let us examine some of these facts.

1st. By the investigations of the majority of the physiologists (see Flint's "Text-book of Physiology" and others) the rectum is not a receptacle for the faecal mass, but an avenue of transmission. It is intolerant of the presence of faeces, expelling them downward naturally when convenient, but contracting, and returning them into the colon if their exit is prevented. Gynecologists, by their daily examinations in the vagina, are familiar with the fact that the rectums, even of women of torpid habits, are comparatively seldom found loaded with faeces, but empty, and flattened between the vagina and sacrum.

2d. Faeces descend and reascend easily from the rectum to above the sigmoid flexure of the colon. In persons of regular habits the desire for defecation indicates the presence of faeces in the rectum. If the opportunity is lost, they reascend to the colon, remaining perhaps for many hours, or even a day, before descending to the rectum to provoke again the desire for evacuation. Unquestionably, food, such as beef-tea, injected into the rectum, even by the shortest pipe of a syringe that can be used, must soon disappear like the faeces, by ascent above the sigmoid flexure of the colon. "I will give one caution," says Allingham—"Diseases of the Rectum," 1873: "if you wish to let the bougie remain in the rectum all night, take care to secure it by a tape. I have seen a short bougie pass up into the bowel above the stricture out of reach, and considerable difficulty was experienced in removing it."

3d. Injections of a quart or more (as are often given) certainly more than fill the rectum, and, therefore, must ascend by the muscular contractility of the rectum quite easily into the colon, thus showing that food can be propelled upward in the same manner; we can seldom recover more than a small part of any injection (even one far short of distending the rectum), from the fact that it passes upward into the colon. Large injections often excite the passage of faeces, and yet the fluid used remains, none at all passing away.

Mrs. S. W., aged about 40 years, under the care of Dr. I. L. Harris, of Milledgeville, Ga., was the subject of a large ovarian tumor. Ovariotomy was performed by the late Dr. W. L. Atlee, of Philadelphia. Excessive vomiting succeeded. Rectal alimentation was diligently attempted. "None of the beef-tea escaped per anum, but it was constantly, for several days, vomited from the mouth. The vomiting of the nourishment was preceded by stercoaceous vomiting, but afterward the beef-tea came up almost clear and entirely *unmistakable*, as satisfactorily proved by chemical tests." Dr. Atlee, in his reply to the letter of Dr. Harris, reporting this feature of the case, wrote that he had observed a similar occurrence "from inverted peristaltic action," in one or more of his former ovariotomies.

4th. In an extreme case of non-gravid nausea, under the care of Dr. J. B. Ficklen, of Washington, Ga., I found it impossible to prevail upon the patient to continue nutritious enemata. She complained that in vomiting she invariably tasted the beef-tea that had been injected, in the matters discharged from the stomach.

5th. It is known that fluids have been forcibly injected through the colon, "and even made to gravitate slowly through the ileo-cæcal valve along the whole track of the small intestine into and through the stomach, and even out of the mouth. . . . The feasibility of this was long ago," says the recent author,¹ "demonstrated by the illustrious Haller,"—"Primæ Lineæ Physiologiæ," 1767. We are aware that a distinguished Fellow of this Society, Dr. Robert Battey, of Georgia, has accomplished the same feat, but cannot now lay hands upon his valuable paper.

¹ *Essay on Rectal Medication*, by W. Bodenhamer. New York, 1878.

Some of the above instances will show that, under efforts made by mechanical means forcibly applied, in all instances the way is clear for the gradual passage upward—less naturally and with less facility than downward, of course—for the ascent of liquids from the rectum and large intestine even to the upper termination of the alimentary tract. Of course, in the propulsion onward and upward of the fluid in these cases, reverse or retro-staltic action, and not in all of them the first mechanical force of the instrument used, will be recognized as an agent in the progression of the fluid.

But, as I am discussing retro-stalsis as a dynamic act in its agency in the upward movement of the injected food, upon which movement I have claimed that its digestion and absorption depends, and, therefore, upon it also the success of rectal alimentation, I will briefly refer to a few more facts of common observation sufficiently analogous in character to show the possibility of intestinal inhaustion. There is no section of the alimentary tract which may not be shown in certain conditions, and under certain influences, to perform retro-staltic acts capable of propelling upward its contents.

1st. "Gagging" is an action of the faucial muscles which reverses that part of the act of deglutition in which they are concerned.

2d. Vomiting, regurgitation, rumination (Copeland—Pavy), and several acts of this class, concern both the œsophagus and the stomach. The contents, both solid and fluid, ascend, being forced up into the mouth and out of it.

3d. The familiar phenomenon of the ascent of bile into the stomach indicates inhaustion between these two portions of the alimentary canal.

4th. Chylous vomiting (Pavy) is inhaustion from the small intestine, the result of a reversal of peristalsis.

5th. The stercoraceous vomiting in ileus and in strangulated hernia, and in a few other conditions of serious intestinal disturbances, in which the matters are fluid, semi-fluid, and solid, tells its own history, and we know the journey it has taken, and that it must have passed through the ilco-caecal

valve.¹ Here is intestinal inhaustion, the very inhaustion we claim as the indispensable factor in all effectual rectal alimentation. It must invariably occur when rectal nutrition is accomplished. The remaining portions of the canal have already been referred to.

6th. The ascent of the faeces under restraint of the sphincter ani, in which the solid mass, as before stated, ascends above the sigmoid flexure; the ascent of enemata filling the colon when injected only within the sphincter.

We have seen, then, that every section of the intestinal canal is at times subject, under circumstances generally of irritation or disturbance of various kinds, to inhaust or receive from below the contents of the section continuous with it. That which is so familiarly and demonstrably true as pertaining to one and all of the parts of this alimentary canal may certainly, under similar circumstances, be predicated as pertaining to the whole. Then this upward movement, continuously maintained from the rectum to the small intestine, is what I would designate as the intestinal inhaustion subservient to rectal alimentation.

Experimental Research.

Although, in the foregoing enumeration of observed phenomena, a logical demonstration of the existence of intestinal inhaustion, convincing to most minds, may have been arrived at, I have yet sought to give to it the confirmation of actual experiment. Experiments in rectal feeding on the lower animals have been made, I think, by Leube, and perhaps others, but simply to test its efficacy, and also the nutritive power of certain rectal aliments. My present effort had no such object in view. It was made solely to establish the fact of the upward progression of injected aliments, from the rectum to the small intestines, by retro-staltic action. By the sug-

¹I am aware that Bointon (see Payv) has denied that there is any such thing as a reversal of peristaltic action. He describes a downward current that always exists and that is never reversed, while the phenomena of stercoraceous vomiting depend upon a central current. Well, then, the rectal food ascends by way of this "central current."

gestion of intestinal inhaustion and its experimental demonstration, I hope to "cut the Gordian knot" of rectal alimentation.

Some carnivorous animal, as the dog, with a short alimentary canal, would certainly have been more suitable as a subject for an experiment in intestinal inhaustion. I could not, it appears to me, have made a more unfortunate selection than that of a ruminant.

Rectal Feeding of Kid for Eighteen Days with Colored Aliment.

September 2, 1878, 2 o'clock, P.M.—Subject, a suckling kid, six weeks or two months old. Injection after twenty-four hours' privation of food. Instrument, a piece of No. 8 gum-elastic catheter, five inches in length, attached to an India-rubber bulb of Mattson's syringe. I injected three ounces of rich milk, deeply colored with a decoction of madder and solution of cochineal. Result: nearly all of the milk was immediately expelled, together with a large dejection of the faecal scybalæ peculiar to the defecations of the sheep, goat, and some other animals.

Nine o'clock, P.M.—The injection was repeated after the same manner, and retained.

September 3, 10 o'clock, A.M.—I injected three ounces of colored milk. Defecation immediately; nearly all of the fluid lost. Injection of two ounces was repeated in thirty minutes, and retained.

Three o'clock, P.M.—Injection of two ounces of colored milk; no defecation; enema retained.

Ten o'clock, P.M.—Injection repeated—two ounces; retained.

A detail of the processes and occurrences of our prolonged experiment would be but tedious and without interest. The process, as detailed for the first two days, was continued for eighteen days, till the 20th of September, when the kid was killed by prussic acid dropped upon the tongue. The intervals of administration of the colored fluid were from three to five hours. The defecations became less and less frequent, and when a single bulbful was injected the fluid was generally retained. A small amount of corn-meal was mixed with the milk for the last five days. The kid was also given, two or three times during the experiment, a small handful of apple-peelings and some bread, to lessen hunger. The experiment was not intended or conducted in a manner to test the efficiency of rectal feeding to support the kid's nutrition. It retained its activity and strength, however, in a surprising degree. As to the effect of the injections in relieving hunger or thirst, it was difficult to decide. The animal certainly made less noise by its bleating for some time after receiving the injection.

No observations were made in regard to the urine. The bladder was collapsed at the time of the autopsy.

The faeces were somewhat carefully observed. At first the scybalæ passed at the time of giving the injections were found to be reddened on the surface, from being bathed in the milk and gruel; but, on being broken, they were of a dark color interiorly. Later in the course of the investigation, the balls became lighter

in color, and when broken were found to be colored throughout by the cochineal. Those found in the intestine at the post-mortem were all of this character—colored.

Autopsy.—In this examination I was kindly assisted by Dr. John S. Coleman and Dr. A. Sibley Campbell.

September 20, 1868, 5 o'clock, P.M.—The injections had been applied from 7 A.M. to 3 P.M. four times, to insure the presence of the fluid in the intestine.

Emaciation not extreme, but no subcutaneous fat,—no fat above the viscera. The intestines and gastric cavities were somewhat distended with inodorous gas. The very long intestine was carefully examined at intervals, from the anal termination to the last stomach.

On opening the abdomen, and previous to slitting open the intestinal wall, dark red discolorations were seen occupying many inches of the tube, though not continuous throughout. These were found in all parts of the tract from the anus to the maws. On slitting the tube, these parts of the intestine were found to contain the coloring matter of the injected aliment. The fluid was carefully examined, though no test was applied. In none of the physical appearances did there seem to be any occasion for doubt. In addition to the colored fluid, large numbers of the faecal scybala or "balls" were scattered throughout the whole length of the tube. The larger proportion of them consisted of matter which was colored by the stain of the cochineal and madder. I have retained the viscera of the kid used in the above experiment, preserved in a solution of chloral. Whether an examination of sections of the intestinal wall and of the mesentery will detect the coloring matter in the lacteals, I have as yet had no proper opportunity to determine.

Thus, so far as the above single and somewhat imperfect experiment goes, we may be said to have added actual demonstration to our rational deductions, in regard to the retro-staltic action of the intestinal canal. The analogy between the goat and the human subject is perhaps too remote to found upon it any very important deductions, but I think a deeper study of the subject of intestinal inhaustion will develop the fact that retro-stalsis is by no means an action of the intestinal canal, which is to be considered *only* in its relations to rectal alimentation. I am most confident in the opinion that "the progression of the chyle," as it was formerly called, is by no means a progression always in one direction, downward, as is the present opinion, by peristalsis, but that there are alternations of prostalsis and retro-stalsis—progression and retrogression—during which, in ordinary normal intestinal digestion, the alimentary mass or fluid is presented again and again to the villi and lacteals and mucous surfaces, for elaboration and absorption. But our consideration of

intestinal action now must be limited to the relations of our present discussion.

I have heretofore remarked that "under certain conditions" the above described retro-peristalsis, or inverted vermicular action, in the several portions or in the entire length of the alimentary canal, may reverse the direction in which it ordinarily acts; that prostalsis, by which all its contents progress downward, may become retro-stalsis, in which by intestinal inhaustion, the as yet unrecognized function, it will be drunk in from one lower portion of the intestine to an upper, until the mass finally reaches the small intestine. It but remains now, and the investigation is of the utmost importance to us, considering the character of the cases in relation to which I am discussing rectal alimentation, to inquire whether or not the pregnant woman, laboring under the uncontrollable nausea and vomiting and impending inanition incident to her state, can be said to present conditions in which intestinal inhaustion is likely to be excited. Is hers not *par excellence* the very condition?

GRAVID NAUSEA AND INANITION.

Terms descriptive of the long recognized relation (of some kind) between the pregnant uterus and the almost invariable concomitant gastric disturbances are not very numerous, and some of them indefinite and awkward. I have heretofore frequently used the term "gravid nausea," and here suggest it as the most convenient for this form of hystero-neurosis. For the term hystero-neurosis I am glad to render acknowledgment to a Fellow of this Society, Dr. George J. Engelmann, of Missouri.¹ It at once indicates the origin and the complex pathology of a large variety of reflex manifestations. The most frequent, the most inevitable, often the most distressing, and frequently for the time being the most uncontrollable of these hystero-neuroses, is the nausea and vomiting of pregnancy.

One of the oldest authors by whom anti-peristalsis as such

¹ *Tr. Am. Gynec. Soc.*, vol. ii., p. 483.

is discussed in connection with pregnancy, is Moreau. It will be recollected that the term "sympathy" is but expressive of the phenomena of the then unknown function of reflex action, not enunciated by Marshall Hall until 1837.

In remarking upon "the sympathetic signs of pregnancy," he says: "All these gastric phenomena do not depend upon the same cause; the vomiting in the last period seems to be owing to a sympathetic action, or rather a sort of nervous irradiation which extends from the uterus to the adjacent organs, an action which we can understand and explain in the following manner: the uterus, being a centre of attraction during pregnancy, and constantly changing in size during the first three months, is impeded in its development by the resistance of the bones of the pelvis, and incarcerated, as it were, in the pelvic cavity. It reacts forcibly on all the abdominal viscera by means of the numerous ramifications of the great sympathetic, from the hypogastric plexus of which its nerves chiefly originate. The nervous irradiation, the consequence of the compression and exaltation of the sensibility of the uterine nerves, extends to the solar plexus, reaches the epigastric centre, causes anti-peristaltic contractions of the stomach, and consequently vomiting."¹

The above is valuable as stating in the most terse and pertinent manner one of the means by which the pregnant uterus is converted into a sensitive excitor to the reflex phenomena presented by the digestive organs, namely, its compression and exalted sensibility. To this the gynecologist of the present day knows full well may be added the irritation of inflammatory states of the cervix, as abrasion (Sims), ulceration (Bennett), but more frequently than all, gravid malpositions, which greatly add to the compression and consequent exaltation of sensibility in the uterine nerves.

It is important to the object of our present discussion to call attention to the fact that in reflex disturbances of the alimentary canal, from whatever direction they may have originated, there is more frequently a reversal of the ordi-

¹ *Practical Treatise on Midwifery*, by J. F. Moreau, p. 116.

nary direction of its muscular action than any mere exaggeration of normal peristalsis: intense pain and syncope, when they affect the digestive organs, produce nausea; the injured mamma, the inflamed ovary, the bruised testicle, the irritable uterus, all exemplify this; nephritic colic is attended with nausea, but strangulated hernia and ileus with stercoraceous vomiting. The habitual and long-continued local irritation in the uterus, consequent upon gestation and the nutritive processes of which it is the centre, establishes it, for the time being, as the common excitor and disturber of many organs, to the functional activity of which its relations ordinarily are by no means obvious. Among these, none appears more prominently affected than the stomach and intestinal canal. The effect of a large number of pregnancies—it will be admitted the majority—is to establish an abiding and habitual irritability of the gastro-intestinal canal, the stomach especially; but every portion of the tube is in ready response to irritation. That this response is, as a rule, by inverted rather than direct action, common observation will substantiate—the habit is retro-staltic; borborygmi in the colon, eructations, regurgitations, nausea, and vomiting in the stomach, with a constipated habit, far more frequently characterize the gastric and intestinal action of pregnant women than diarrhoea and other manifestations of downward action.

From the above consideration of the effect of gravid uterine irritation upon the gastro-intestinal canal, namely, its predominant predisposition and tendency to retro-stalsis, the conclusion would seem inevitable that, of all the conditions of gastric disability in which rectal alimentation could be demanded, that of the nausea and inanition of pregnancy is the most favorable.

Not only is the great practicability of rectal alimentation in the majority of severe cases highly probable, but injury in such cases is reasonably to be apprehended as a result of buccal ingestion. That the long-continued influence of reflected irritation upon any organ, whether through reflex-motor or reflex-secretory action through the ganglionic system, is capable of dynamically altering its structural condition,

has for some time been known. It was long since shown¹ that the reflected dental irritation of the fifth nerve in infants is capable not only of modifying the secretions of the stomach and alimentary canal, but also of influencing their vascularity, giving rise to the gastritis and enteritis of the cholera infantum at the period of the first dentition, as also to the various cutaneous eruptions of that disastrous phase of infantile existence. In the remarks accompanying the report of a highly interesting case of gravid nausea, successfully treated for five weeks by rectal aliments, by Dr. A. Y. P. Garnett, of Washington, the opinion is expressed that "uterine irritation reflected for a protracted period upon the stomach often establishes a true gastritis, which may constitute one of the conditions imperatively demanding rest."² Though many deny that there is organic change in the mucous membrane of the stomach, it is highly probable that in some extreme cases this hyperaemic condition is evoked. Such a condition could only be aggravated by the gastric ingestion of aliments.

CONCLUSIONS.

The following principles may legitimately be deduced from the foregoing discussion :

1st. That the exhaustion resulting from gravid nausea not infrequently demands a supply of food over and above that which can be retained by the stomach. Death has resulted from the inanition thus produced.

2d. That the number of well-authenticated cases on record—ranging from three months to five years—fully demonstrate the adequacy of rectal alimentation to sustain nutrition unassisted by other means of ingestion.

3d. That rectal nutrition requires rather an explanation of its *rationale* than a demonstration of its truth.

4th. That water and tenuous, nutritious, and medicinal

¹ *Southern Med. and Surg. Journal*, June, 1850.

² The report of this valuable case came to hand too late for introduction in the present paper. The notes of a most painful case of gravid nausea—death without delivery in the eighth month of gestation—have recently been furnished to me by my distinguished friend, Prof. L. A. Dugan, of this city.

solutions are probably absorbed directly into the blood, or by the portal radicles and mucous membrane of the rectum and colon, for digestion in the liver.

5th. That the digestion of composite aliments is never effected in the rectum or colon, on account of the absence of the "digestive fluids" universally recognized as indispensable to their disintegration and solution. Their undissolved condition and the absence of absorbent vessels in the rectum and colon prevents their entrance into the blood from these portions of the alimentary canal.

6th. That the admixture artificially (Leube) of digestive principles, pancreatic juice, etc., with the injected food, is not necessary or important to the efficiency of rectal nutrition.

7th. That the "vicarious secretion" (Flint) of the elements of the gastric juice, pancreatic juice, and other digestive fluids by the glandular structures of the rectum, for the preparation of the rectal aliments, is highly improbable, and certainly not necessary to accomplish their ultimate digestion and absorption into the blood.

8th. That the secretion of these fluids from their proper surfaces and glands (Flint), as the stomach, pancreas, liver, etc., and their descent into the rectum, may also be denied as one of the conditions to success in rectal nutrition.

9th. That the true explanation of the almost uniform efficiency of rectal alimentation and its physiology is to be found in the reversal of normal peristaltic action: first in the rectum, sending the injected aliment above the sigmoid flexure, and then past the colon and ilco-cæcal valve into the small intestine. Here digestive fluids for their disintegration, solution, and chylification are abundant, and here also lacteals abound for chylous absorption. This retro-staltic action, when continuous, as in rectal alimentation, accomplishes the ascent of the nutriment from the rectum into the small intestine. As here considered, I believe "Intestinal Inhaus-tion" to be a newly recognized function of the alimentary canal. It is to the intestines what deglutition is to the stomach. Through its instrumentality, rectal and buccal ingestion are as nearly as possible equalized in both their *rationale* and their results.

10th. That the nutrition of the body by rectal aliments can be accounted for solely on the recognition of intestinal inhaustion. Without it the digestion and absorption of such solids or semi-solids as boiled eggs (Flint), meat-broths, and pulps, could not be explained.

11th. That the present view in regard to the movement of the contents of the alimentary canal is probably incomplete; and that aliments, whether from buccal or rectal ingestion, while undergoing digestion and absorption, are not subjected solely to a downward movement, but to alternations of progression (prostalsis) and retrogression (retro-stalsis), passing and repassing the absorbent surfaces of the intestine repeatedly, till deprived of nutritive elements.

12th. That the rectal ingestion of food is a valuable substitute for gastric ingestion in all cases of disability of the upper portions of the alimentary canal.

13th. That in the early months of gestation reflected uterine irritation establishes a habit or abiding tendency to retro-staltic action in the muscular tunic of the entire alimentary canal; and that it is from this retro-staltic irritability that the nausea and vomiting of pregnancy originate.

14th. That, on account of this retro-staltic irritability, so manifest in early gestation, the intestinal inhaustion of rectal ingesta is greatly facilitated; and that this circumstance renders gravid nausea, above all others, the condition most favorable for efficient rectal alimentation.

15th. That, under the careful and systematic application of rectal alimentation, artificial abortion for the relief of gravid nausea can be banished from practice, even as a last resort.

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